



# TRANSPORT SOLUTIONS FOR A GROWING CITY

MAY 2016





“

Aucklanders tell me every day  
that we need to fix this city's  
transport problems.

Mayor Len Brown  
29 October 2014

”

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# Executive Summary

## Auckland's transport system is at tipping point.

Roads and public transport systems are full to over capacity at critical times. Minor service interruptions are resulting in network-wide distortions. Congestion is choking major corridors throughout increasingly long periods of the day, stifling economic productivity and undermining Auckland's competitive advantage - its quality of life. Public transport services are overflowing at peaks and vastly underutilised the rest of the time.

The system is under immense pressure today and projections are that things will get much worse.

Auckland is not the only city in the world with these problems, but in proportion to city size, they are as bad here as anywhere else in the developed world.

Authorities have responded with a comprehensive series of reforms and initiatives. Amalgamation, residential rezoning, proposed new funding tools and a step-change in investment have all been linked to addressing Auckland's transport problem.

Efforts have led to some success. Monitored travel time variability and delay have reduced, even while record growth has increased demands on the road network, and public transport service levels and patronage have improved significantly.

Nevertheless, projected future declines in accessibility and mobility have led to the formation of a combined central and local authority transport workstream – the Auckland Transport Alignment Project.

ATAP has aligned central and local objectives for transport and agreed the challenge confronting Auckland. It has confirmed that transport performance in Auckland is now at tipping point.

Over the next decade, many workers will find it harder to get to work, many businesses will find it harder to employ the right people and Auckland's quality of life will be severely impacted. Public transport will improve, but not in a way which reduces stresses on the road network, and cars will continue to provide for the overwhelming majority of trips.

That ATAP has agreed the key objectives to be achieved is a significant step forward. Reprioritisation of the investment programme will reap benefits and inclusion of demand management will add to the range of tools available to policy makers.

But alone, these measures will not be enough.

Transport authorities are already heavily committed to keeping Auckland moving and have mobilised a record level of resources. That congestion is set to deteriorate so rapidly and public transport continue to play a marginal role overall indicates issues are not solely rooted in the transport sector.

The demand for travel generated by misaligned land use and transport policy in Auckland is the problem.

Land use rules as set out in the proposed Unitary Plan, which allow development in areas unserviceable by quality public transport, will exacerbate private vehicle dependency at the same time as investment shifts away from road capacity enhancements. Concurrent development restrictions in areas around rapid transit and close to activity hubs, such as the CBD, will undermine the benefit of investing in alternative modes.

Either land uses across the city must change or the transport programme be substantively revised, or both, if congestion is to be relieved and alternative modes made more competitive.



The Auckland Plan, proposed Unitary Plan and planned transport programme must be reworked to deliver better outcomes. The needs and expectations of residents must be understood not solely in terms of what they say, but what they will do. There is strong evidence to show that residents want both a compact city and detached housing; public transport and private vehicles; congestion fixed and rates increases stopped.

Understanding what they are prepared to trade-off is critical to delivering public objectives. The pathway to responding to needs and improving outcomes cannot be undertaken at a blanket regional level. A targeted “spatial” approach to growth management is required. Regional provisions must be replaced by local, place-based decisions which reflect the individual, unique needs of communities and services at the level where impacts are felt.

Communities must become part of a planning process framed around robust empirical understanding of infrastructure and development capacity at the neighbourhood level.

Infrastructure service availability must become the determining factor in identifying opportunities for growth. Where infrastructure, most notably transport infrastructure, is inadequate, new development should only be permitted as and when new services are funded and committed.

Legislation must ensure an adequate forward supply of infrastructure-supported green and brownfield land is available at all times to meet development needs. A sequenced land use plan which allocates growth when and where infrastructure services become available without inflating land values is the ultimate growth management objective.

In order for public transport to be facilitated, restrictions which prevent development around rail and busway stations must be loosened. Fewer restrictions will allow developers more flexibility, lowering investment risk and catalysing investment. More activities closer to rapid transit will enhance the competitiveness of public transport as a mode and faster construction will improve the business case for investment.

Development must be disincentivised in areas away from quality transport until services are enabled or congestion will worsen.

Development capacity around public transport will help, but it will not be sufficient to transition Auckland from a car-based city to a public transport oriented city consistent with the Auckland Plan. For this to be achieved land use needs to be dramatically reformed across the metropolitan area. Services must be brought closer to residents so that the speed and convenience advantages of private vehicles are matched by walking, cycling and public transport.

Rezoning and retrofitting established suburbs in this way is more expensive and less efficient than targeted scale development of greenfield and industrial land around rapid transit. Rezoning such land for dense residential development will provide an immediate value improvement which can be captured by authorities and used to fund infrastructure. New centres, master-planned to integrate land use, public transport, walking and cycling, will deliver the lifestyle desired by residents and authorities.

Even the most carefully designed and integrated land use-transport solution for Auckland will require new road capacity to meet the needs of business, including heavy and light commercial traffic. Intra-regional mobility is essential to supporting Auckland’s service economy which is dominated by small to medium enterprises which employ seventy percent of the workforce. Adding one million more residents on top of an already congested network will exceed the capacity of the network under all planned scenarios.

## Key Recommendations

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An eastern corridor linked to a Waitemata Harbour tunnel landing at Grafton may provide the capacity and connectivity needed and should be carefully evaluated. An alternate route around the CBD will reduce capacity constraints along the heavily congested southern motorway corridor. It will link businesses in the north, east and south to the port, CBD and provinces.

Connecting this network with a pricing mechanism which optimises traffic flows will maximise economic performance and liveability and provide the revenue needed to support increased investment. Aucklanders have said that they are willing to accept user charges, provided the benefits exceed the costs.

New technologies are already providing transport benefits and should be expanded. Intelligent transport networks and autonomous vehicles will improve options for the future, but their timing, uptake and costs are difficult to predict. Waiting for technology to solve Auckland's existing and burgeoning transport crisis is not an option. The network of tomorrow must be planned on information available today. The best policy response is one which meets existing and projected needs and remains nimble and flexible enough to change as evidence changes.

Existing evidence shows the current plan for Auckland will not meet the expectations of authorities, residents or business. It must now change, just as it will need to change to meet radical technological evolutions in coming decades.

- The ATAP process is critical to addressing looming transport issues in Auckland and its recommendations for improving Auckland's transport programme should be given careful consideration.
- Transport investment needs to be reprioritised to address existing bottlenecks and support growth.
- Land use provisions as set out in the Auckland and Unitary plans are exacerbating transport pressures across the region and must be substantively revised.
- A targeted and sequenced spatial approach to urban development is urgently required.
- Residential development restrictions must be loosened in areas with quality transport access and strengthened in areas without it.
- New capacity for the road network is required and all options, including an eastern-aligned harbour crossing connecting to an eastern corridor, should be rigorously evaluated.
- To optimise road network capacity, provide a revenue stream for ongoing network improvements and accommodate electric vehicles, road pricing is essential.
- Technology does not yet provide a silver bullet solution to Auckland's transport issues, but can significantly improve service levels for little cost and should be prioritised.
- Land use and transport policy must increase in flexibility to adapt to technological and other changes if and when they become clear.



# Background

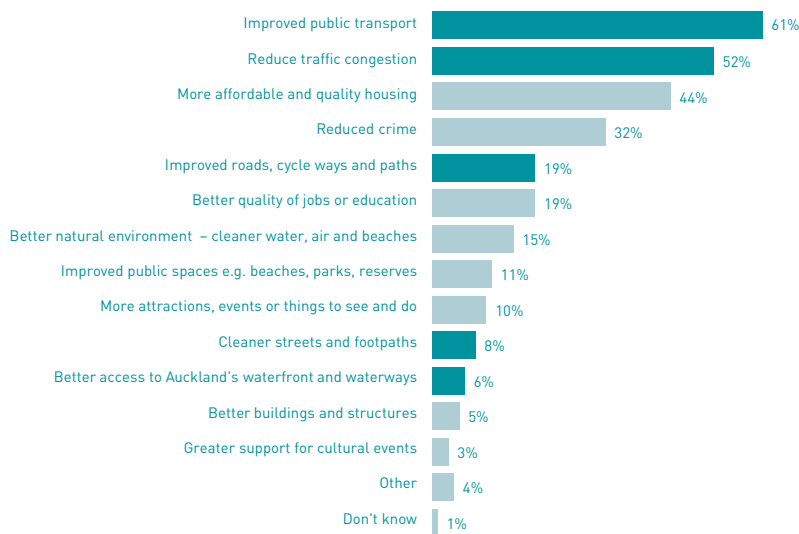
## Transport is the Auckland issue

Auckland's transport situation is not just bad, it is by all accounts the worst thing about living and working in the city.

The largest and most comprehensive recent survey of public opinion on Auckland issues found that transport issues occupied the top two places of issues perceived to be holding Auckland back from becoming the World's Most Liveable City (Figure 1). In fact, three of the top five and five of thirteen key regional priorities related to transport.

FIGURE 1

### Key priority areas for Auckland to become the World's Most Liveable City<sup>1</sup>



A 2013 Herald 'Digi-poll' survey of 500 residents also found that a very high 44 per cent ranked transport as the city's biggest issue, well over twice the number who identified second ranked housing as the top challenge.<sup>2</sup> Other surveys by the AA,<sup>3</sup> Horizon<sup>4</sup> and elsewhere have all echoed similar findings.

Not surprisingly, the public's discontent with Auckland's transport system is reflected politically. The Auckland Council identifies transport as the "single biggest issue for Auckland"<sup>5</sup>. Then incumbent Mayor Len Brown successfully ran for the mayoralty in 2013 on a platform which listed transport at the top of his three priorities,<sup>6</sup> something all leading candidates for the 2016 Mayoralty have repeated.

The scale of Auckland's transport challenges has made the issue not just a local, but a national issue. Successive Ministers of Transport, including Gerry Brownlee and Simon Bridges have each voiced concern over transport issues in Auckland and the Key-led Government has increased land transport funding and committed significant resources from the national consolidated account to address problems.

<sup>1</sup> Colmar Brunton, Residents' Brand Health and Values Survey, 2013.

<sup>2</sup> NZ Herald, Transport is Auckland's Biggest Issue, 22 October 2013, [http://www.nzherald.co.nz/nz/news/article.cfm?c\\_id=1&objectid=11143807](http://www.nzherald.co.nz/nz/news/article.cfm?c_id=1&objectid=11143807)

<sup>3</sup> AA, Auckland Matters, May 2014.

<sup>4</sup> Horizon Research Ltd, Transport In Auckland, May 2012.

<sup>5</sup> Auckland Council, Long Term Plan 2015-2025 v. 1, p. 9.

<sup>6</sup> <http://www.scoop.co.nz/stories/PO1307/S00161/brown-seeks-2nd-term-to-push-for-better-transport.htm>

# What's wrong with Auckland's transport system?

Getting around Auckland is not as easy as it could be.

## Congestion is comparatively bad

Some congestion in a city above 1 million is unavoidable, but best available evidence suggests Auckland's problems are as bad, if not significantly worse, than cities of comparable size and wealth.

Digital mapping service Tomtom measures the percentage delay experienced by drivers in over 200 cities across the world, including all those frequently used to benchmark Auckland. Tomtom finds congestion levels in Auckland which are normally indicative of much larger cities.

In its 2014 Index of 'large' (i.e. population 800,000 and above) cities, Tomtom ranks Auckland 41st most congested. Top ranking (i.e. worst) cities tend to be high population, lower income metropolis', such as Istanbul, Mexico City, Rio de Janeiro and Moscow (Los Angeles ranks 10th). Only one metropolitan area under 2 million makes the top 40 and that is Marseille, a noticeably larger city (1.8 million) with an urban form largely evolved in advance of automobiles.

Of cities often compared to Auckland, only a few much larger cities rank worse: London (ranked 16), Vancouver (20) and Sydney (21). Larger comparable cities with less congestion as measured by Tomtom include Melbourne (60), Perth (73), Portland (79) and Brisbane (88). Table 1 ranks all Australasian cities measured by Tomtom, both above and below 800,000 in population, according to the amount of delay experienced in 2014. Auckland's congestion is rated second worst in the region, despite its population (a factor normally positively correlated with congestion) ranking 5th.

Tomtom is not the only measure of congestion. Indeed, because it only measures percentage delay at peak times versus off-peak, it tends to overrepresent the challenge faced by smaller cities with generally more fluid traffic. For this reason Tomtom findings should be viewed as indicative, rather than conclusive. Nevertheless, Tomtom remains the only objective, comparative analysis of congestion in different jurisdictions and remains highly relevant when comparing small-medium cities in New Zealand, Australia, Canada and the US.

TABLE 1: TOMTOM TRAFFIC INDEX 2014<sup>7</sup>

World Rank	Filter Rank	City	Country	Congestion Level	Morning Peak	Evening Peak	Highways	Non-highways
21	1	Sydney	Australia	35%	66%	64%	31%	37%
41	2	Auckland	New Zealand	32%	68%	73%	29%	35%
-	3	Wellington	New Zealand	29%	71%	65%	27%	33%
60	4	Melbourne	Australia	28%	52%	51%	21%	35%
-	5	Christchurch	New Zealand	28%	48%	53%	27%	28%
73	No	Perth	Australia	27%	46%	46%	20%	29%
81	No	Adelaide	Australia	25%	45%	41%	25%	26%
88	No	Brisbane	Australia	25%	43%	46%	18%	28%
-	No	Canberra	Australia	17%	33%	28%	18%	17%

<sup>7</sup> [http://www.tomtom.com/en\\_nz/trafficindex/](http://www.tomtom.com/en_nz/trafficindex/)

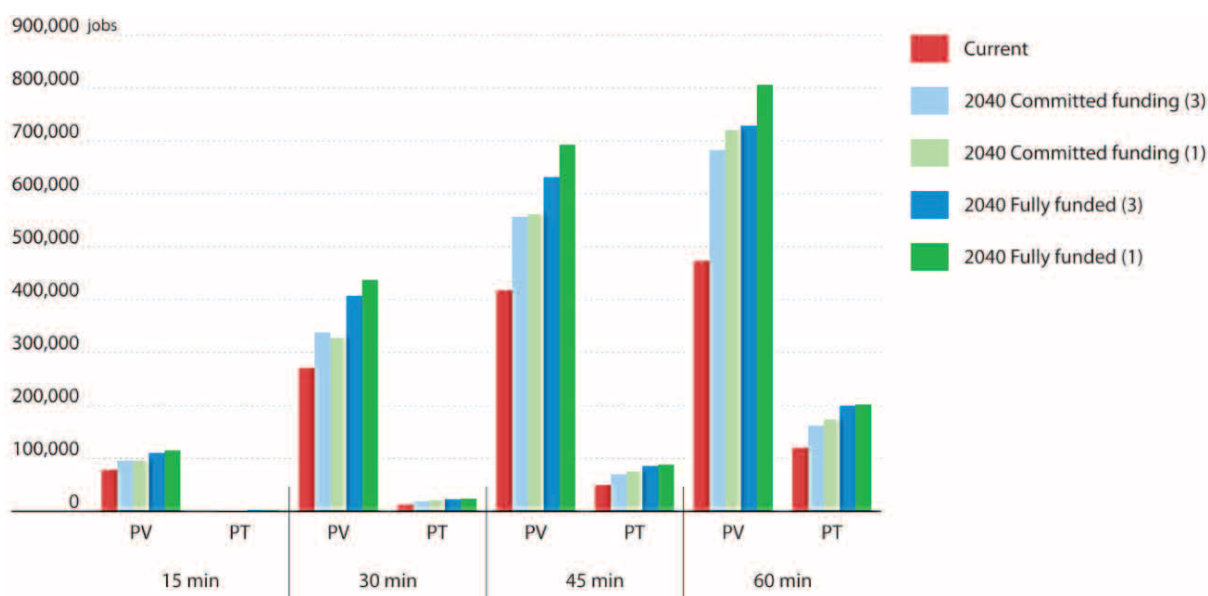


## Public transport is inadequate

Comparatively congested roads increase the importance of an efficient public transport system. However, on this measure too, Auckland underperforms relative to its peers. Only just over 100,000 (14 per cent of a regional total of approximately 700,000) jobs are accessible with less than 60 minutes' commute by public transport, compared to nearly 500,000 by car. Reducing travel time to a figure many Aucklanders would consider acceptable – 30 minutes – finds that just under 300,000 jobs are accessible by car and an almost indecipherably small number, perhaps 10,000, are accessible by public transport (Figure 2).

FIGURE 2

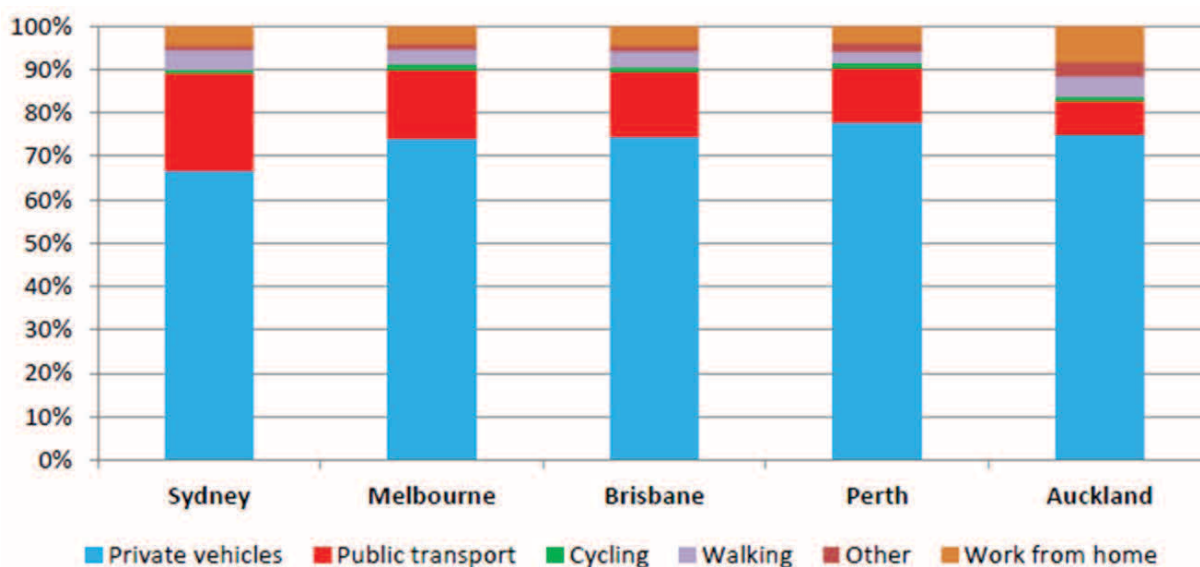
### Number of jobs accessible to households 2012<sup>8</sup>



Interestingly, in total, Auckland's mode share between car and non-car journey to work is not significantly different from most other Australasian cities (Figure 3). What separates Auckland is a lower proportion of public transport use (and a higher proportion of employees who work from home). Consequently, the need for Auckland to expand transport options can be understood primarily as a need to enhance public transport services.

<sup>8</sup> ITP 2012, p. 97. Blue lines denote land use scenario 3. Green lines denote land use scenario 1.

FIGURE 3

Mode splits for Auckland and Australian cities: Journey to Work<sup>9</sup>

Modelling and other data highlighting the challenges facing Auckland's transport system are supported by qualitative research. In addition to the Colmar Brunton study above, liveability indices, such as the Mercer Quality of Living and Economist Intelligence Unit Liveability surveys, score the city down on infrastructure-related performance, a key part of which is related to congestion and the inadequacy of the public transport network.<sup>10</sup> The World Economic Forum's annual Global Competitiveness report similarly rates New Zealand's transport infrastructure poorly, a result at least partially influenced by Auckland transport concerns.<sup>11</sup>

The annual cost of Auckland's congestion is estimated by Auckland Transport to be \$1.5 billion.<sup>12</sup> Yet this figure vastly underestimates the true cost. Assessments of congestion costs tend to be based on approximations of the time vehicles spend in traffic. They do not capture the opportunity cost of this time, such as what value could be generated if five commercial trips were possible each day instead of four. The consequences of travel time uncertainty are also missed – innumerable hours of productivity are lost every year because drivers have to overcompensate for unpredictable journey times.

Whatever the final number, congestion across Auckland's road network is constraining economic opportunity and undermining quality of life. Lack of alternatives is exacerbating public frustration and there is heavy public expectation that the problem will now be substantially improved.

<sup>9</sup> Richard Paling Consulting, Journey to Work Patterns in the Auckland Region, 2014.

<sup>10</sup> See for example Economist Intelligence Unit, A Summary of the Liveability Ranking and Overview, August 2014.

<sup>11</sup> World Economic Forum, Global Competitiveness Report 2014.

<sup>12</sup> Auckland Transport, Annual Report 2015.



## Are future transport projections relevant?

A major feature of all transport future thinking today is how transport services will evolve over the coming decades in response to technological change. Encompassed under the moniker of Intelligent Transport Systems (ITS), digital and sensory technologies including autonomous (self-driving) vehicles, advanced vehicle-to-vehicle communication and signalling and changing transport energy sources will all revolutionise transport over the next two decades.

Rollout of such technology promises to exponentially increase effective road capacity and provide an attractive, affordable substitute for public transport.

Under this scenario, does it even matter that congestion is bad now or in the future or that residents have limited transport options?

In short, yes, because there is no clarity yet as to when or if these technologies will lead to a material change in road and public transport demand. Research conducted to date provides for a very wide range of scenarios, including much more and much less car travel, depending upon the speed of new technology uptake.

A recent research review, for example, undertaken for Auckland Transport by Synergine in association with the University College of London looks at the potential impact of a transition to completely autonomous vehicles (CAVs).<sup>13</sup> The review concludes that the capacity benefits of reconfiguring road space or platooning vehicles require at least 50% fleet uptake to generate substantial benefits. A 50% fleet transition to CAVs is not projected to arrive until 2055 (Litman, 2015), and could enable a 22% improvement in effective road capacity. By 2075 the entire fleet is predicted to have shifted to CAV technology, generating an estimated 80% road capacity increase (Shladover, Su, & Lu, 2012).

A further study by OECD transport body the International Transport Forum (ITF) finds that TaxiBots (self-driving cars that can be shared simultaneously by several passengers) combined with high-capacity public transport could remove 9 out of every 10 cars in a mid-sized European city – assuming all cars were autonomous. Alternatively, AutoVots (which pick-up and drop-off single passengers sequentially), without high-capacity public transport, could result in nearly eight out of ten cars being removed.

However, the ITF study found that a dramatic drop in the number of cars will not mean congestion will be solved. Rather, two key findings were that total kilometres travelled will increase and impacts on congestion will depend significantly on system configuration. A TaxiBot system with high-capacity public transport will result in 6% more car-kilometres travelled than today, because these services would have to replace not only those provided by private cars and traditional taxis but also all those provided by buses. On the other hand, an AutoVot system in the absence of high-capacity public transport will nearly double (+89%) car-kilometres travelled. This is due to repositioning and servicing trips that would otherwise have been carried out by public transport.

A TaxiBot system in combination with high-capacity public transport uses 65% fewer vehicles during peak hours. An AutoVots system without public transport would still remove 23% of the cars used today at peak hours. However, overall vehicle-kilometres travelled during peak periods will increase in comparison to today. For the TaxiBot with high-capacity public transport scenario, this increase is relatively low (9%). For the AutoVot car sharing without high capacity public transport scenario, the increase is significant (103%).

<sup>13</sup> For a recent report into a range of scenarios, see Synergine, Potential Impacts of Connected and Autonomous Vehicles, report to Auckland Transport, 2015.



Of greatest concern to policy makers is managing the transition. The study found that if only 50% of car travel is carried out by shared self-driving vehicles and the remainder by traditional cars, total vehicle travel will increase between 30% and 90%. This holds true irrespective of the availability of high-capacity public transport. Looking only at traffic during peak hours, the overall number of cars required increases in all but one scenario, namely TaxiBots with high-capacity public transport.

That transport authorities today have to plan and invest given such an unprecedented spectrum of uncertain scenarios is undesirable, but unavoidable at this time. Authorities are confronted with the choice of either deferring investment and risking huge transport problems in the future or acting on a preferred set of projections and risking unnecessary investment.

No cities or countries globally are known to have developed a cohesive and comprehensive policy response to still emerging transport technology. New Zealand transport authorities have, however, been at the forefront of policy development. In 2014 the Ministry of Transport developed a pioneering ITS Action Plan which is focused on ensuring New Zealand can respond to sector developments. This approach remains global best practice.

The approach of this report, therefore, is to evaluate available information on “known” technologies and data to understand whether current plans satisfy current objectives on available projections. Once plans on known information are optimised, then focus can shift to improving flexibility, nimbleness and responsiveness to technological and other change.



## Authorities have responded

The scale of dissatisfaction with Auckland's congestion and public transport has contributed to a number of very significant, structural changes to the city. Most notably, the wider region underwent governance reform in 2010 and a new planning framework was developed. This process was, in the words of the Royal Commission on Auckland Governance, the result of the

... inability of local government in Auckland to make and implement timely decisions for the good of the region. This is particularly the case in relation to investment in infrastructure and management of growth, with traffic congestion and poor public transport being obvious manifestations of the inability of councils to act cooperatively to address key regional issues.<sup>14</sup>

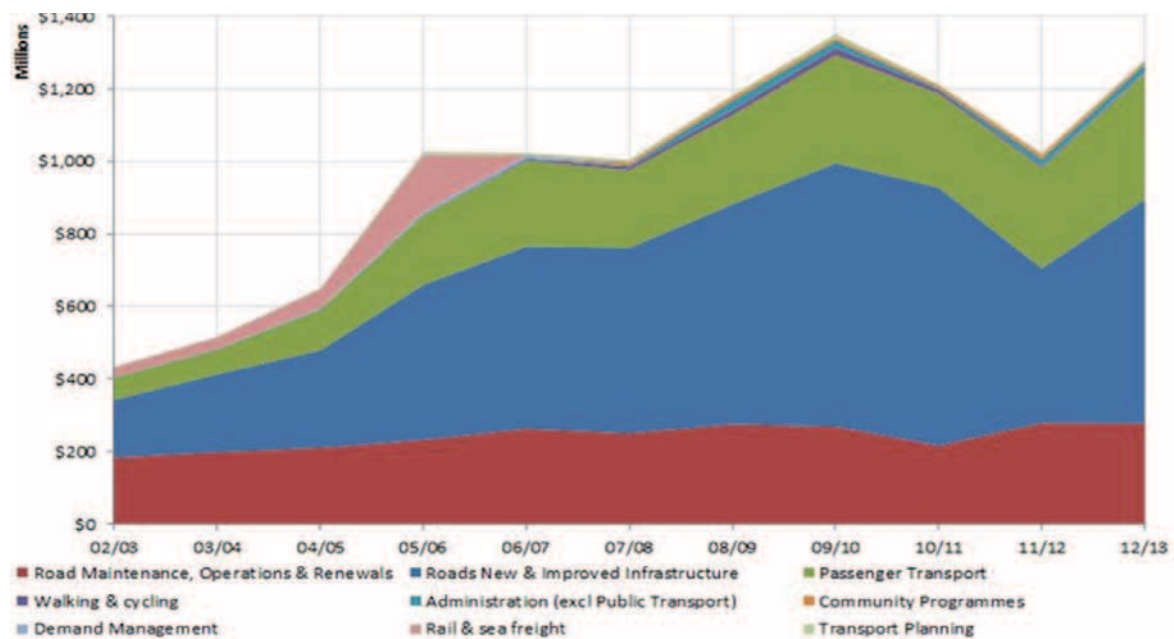
The subsequent vision for Auckland, developed by the new Auckland Council and outlined in the first Auckland Plan, was a compact city supported by quality public transport. This transformation was predicated on a revolution in Auckland's travel patterns and solving congestion was major attraction of the shift to public transport:

"We have to continue investing in public transport so that in future Auckland has the necessary infrastructure in place rather than traffic being gridlocked."  
Mayor Len Brown 25 June 2015

Alongside and even predating structural changes, has been a very sizeable step change in transport investment, across both levels of government. Data shows transport authorities have increased transport spending in Auckland by several orders of magnitude over the past decade.

FIGURE 4

Transport expenditure in Auckland<sup>15</sup>



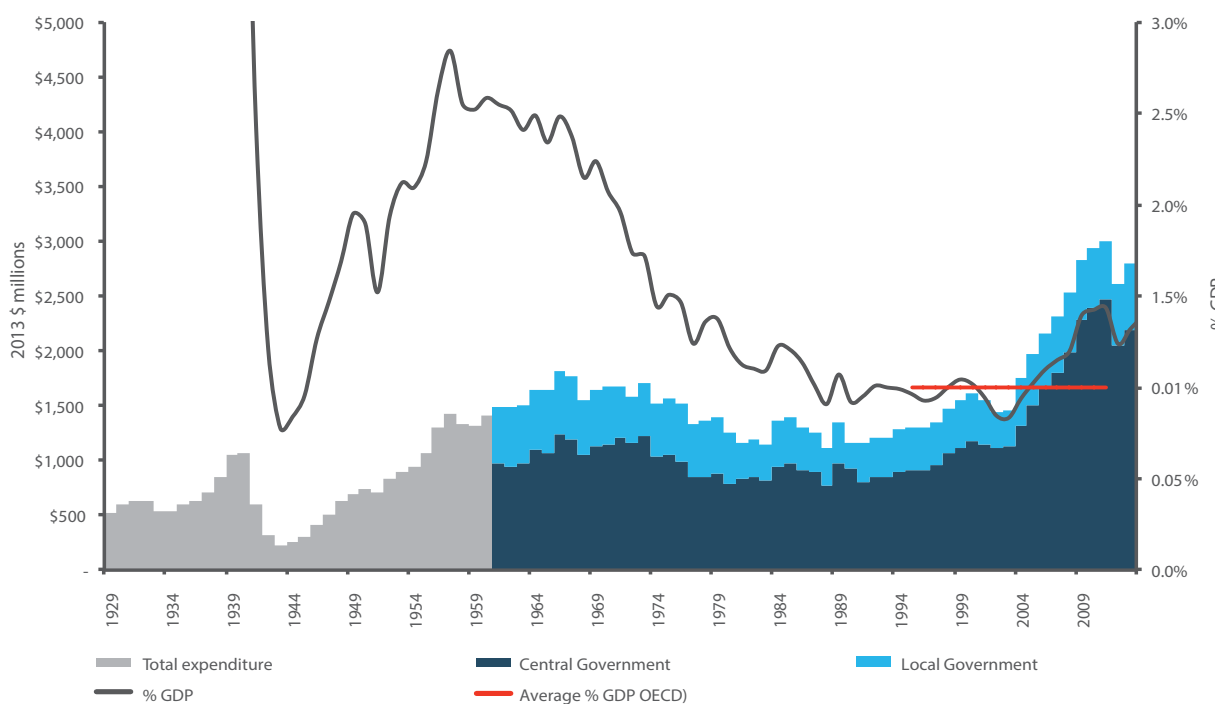
14 Royal Commission on Auckland Governance, v. 1, p. 43.

15 New Zealand Transport Agency.

The level of investment is now significant not only in relation to previous spending, but, given that New Zealand's overall spending on transport is high by OECD standards, is probably beginning to regain some of the ground lost between the 1970s and 2000s.

FIGURE 5

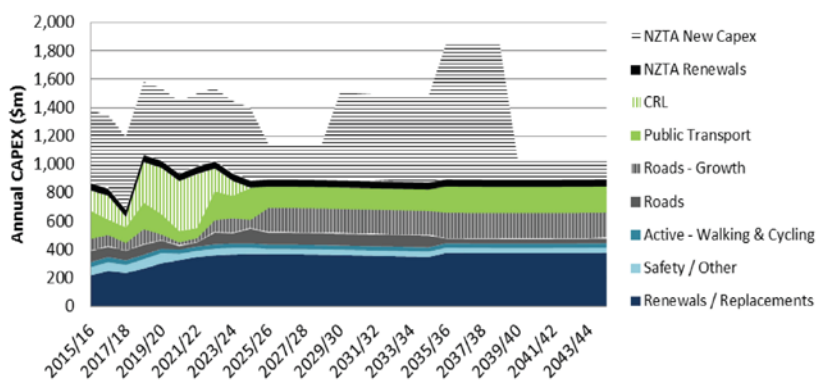
### Total public investment in New Zealand transport<sup>16</sup>



Furthermore, far from being a short term “bump”, investment levels are projected to be sustained indefinitely (Figure 6).

FIGURE 6

### Auckland Transport and NZTA Capital Expenditure 2015-2044<sup>17</sup>



<sup>16</sup> Ministry of Transport, Briefing to the Incoming Minister, 2014.

<sup>17</sup> Auckland Transport.



## The future for transport is bleak

The elevated level of work underway, and planned to continue, to upgrade Auckland's transport system has seen some strongly positive results. Notably, analysis performed by Auckland Transport showed Auckland's high growth over the past decade had been met with flat or even reducing congestion and variability on key corridors.

FIGURE 7

### Auckland congestion levels (minutes delay per km travelled) 2004-2011<sup>18</sup>

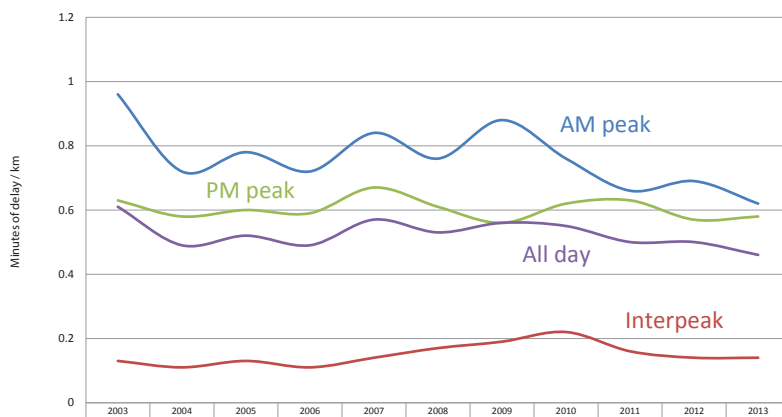
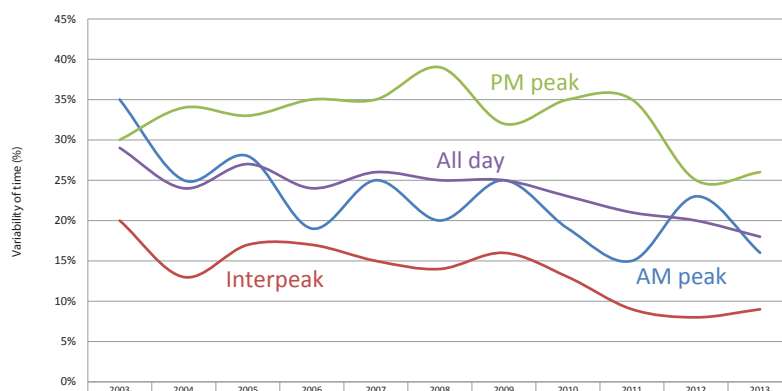


FIGURE 8

### Travel time variability is improving<sup>19</sup>



In fact, repeated analysis has shown that the combination of investments and policies underway since the early 2000s would have the effect of holding congestion on Auckland's freight network steady for over two decades. Furthermore, ongoing revision and improvement of transport plans could be seen to be pushing congestion further into the future and reducing its severity (Figures 9 and 10).

However, a growing body of evidence over the Council's first six years also began to suggest a gap was growing between the aspirations of the Auckland Plan and its modelled transport deliverables. Efforts to improve future congestion performance appeared to be having some effect, but the results remained below expectation. In contrast to transport policies between 2006 and 2026, which could be seen to have contained congestion, performance beyond that time was projected to decline (Figures 9 and 10).

<sup>18</sup> Auckland Council.

<sup>19</sup> Auckland Council.

FIGURE 9

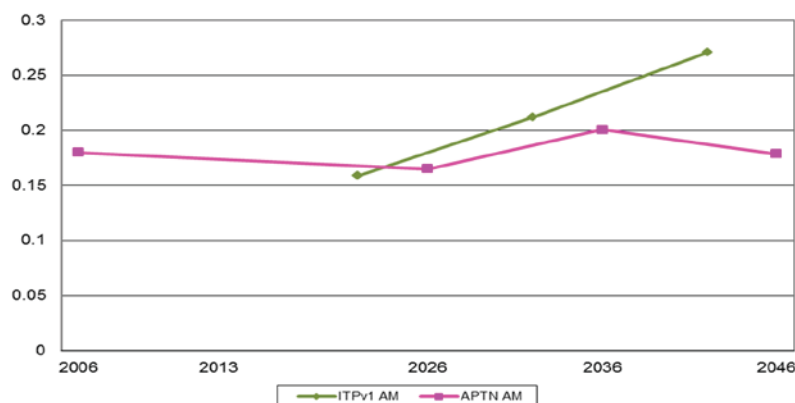
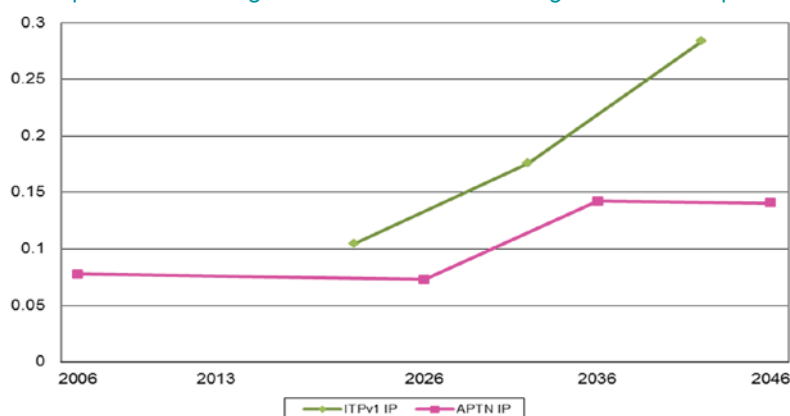
Proportion of freight travel in severe congestion: AM peak<sup>20</sup>

FIGURE 10

## Proportion of freight travel in severe congestion: interpeak



The future reduction in mobility through the interpeak emerged as a major concern. The period between 9am and 4pm is critical to sustaining the Auckland economy. The 2014 National Freight Demands Study found that almost 80 per cent (38 million tonnes) of all freight originating in Auckland was destined for an Auckland address. Due to the short distances travelled and dispersed range of locations, this task was almost completely serviced by road transport. The combination of this feature and Auckland's size means that the Auckland road network supports 16 per cent of New Zealand's entire freight needs.

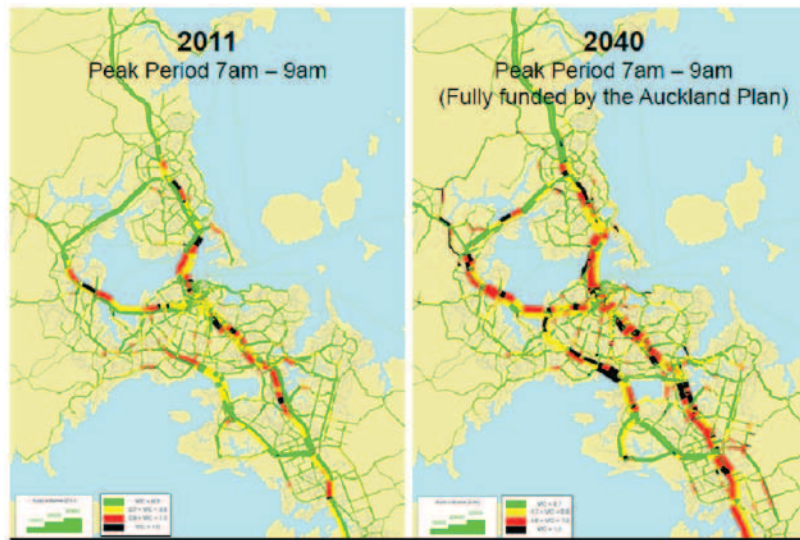
Heavy freight service must be largely met during business hours so is severely impacted by expanding congestion. But it is not the only commercial activity affected by congestion spreading beyond peak times. Light commercial vehicles depend on the road network through the day to service the needs of almost every businesses, student and employee region-wide. The Ministry of Transport estimates that light commercial vehicles make up almost 10 per cent of all cars and vans in Auckland.<sup>21</sup> The relatively high distance commercial vehicles travel plus the extensive use of private vehicles for business purposes means that commercial trips make up a significant proportion of overall interpeak traffic. If interpeak travel was to revert to conditions seen through today's morning peak, the Auckland economy would grind to a halt.

The risk posed by future congestion was most visibly illustrated in a 2012 output from the Integrated Transport Programme (ITP). It showed congestion (indicated in yellow, red and black representing road volume to capacity ratios exceeding 0.7, 0.9 and 1.0 respectively) would become far more widespread by 2040 (Figure 11).

<sup>20</sup> Auckland Council.

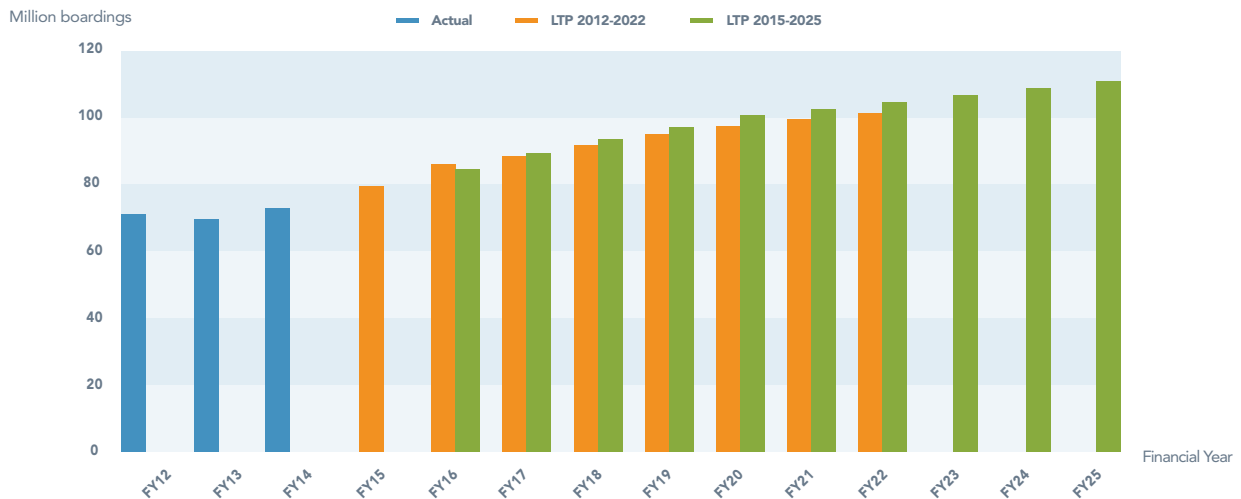
<sup>21</sup> <http://www.transport.govt.nz/ourwork/tmif/transport-volume/tv004/>

FIGURE 11

ITP 2012 Congestion modelling across Auckland<sup>22</sup>

Public transport performance modelled better. All evidence has shown patronage increasing strongly, especially over the next decade, but there is also evidence that projections may be too optimistic. The Long Term Plan 2015, for example, revised down LTP 2012 projections based on actual experience but revised up projections in the future (Figure 12). In addition, the RLTP has revised down the aspirational Auckland Plan target of 140 million public transport trips per annum by 2022. It is now expected that, by 2025, closer to 110 million trips will be taken.

FIGURE 12

Public Transport Boardings<sup>23</sup>

<sup>22</sup> Auckland Transport.

<sup>23</sup> Auckland Regional Land Transport Plan 2015-2025.

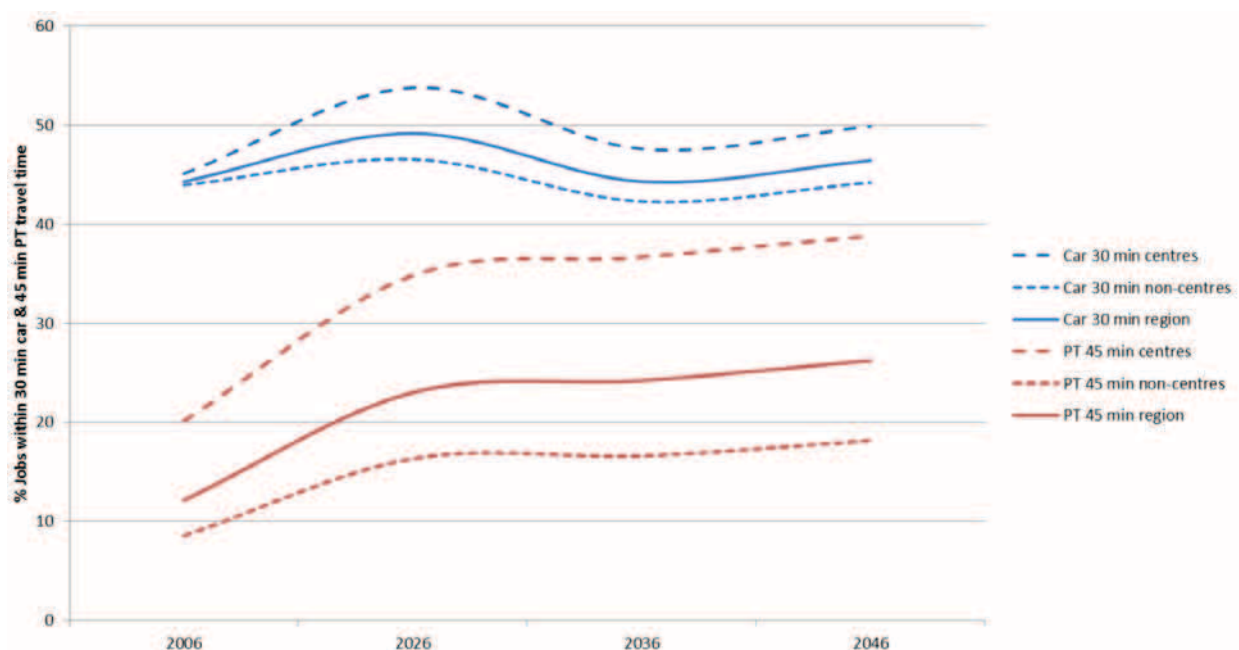


Public transport access to employment was also modelled to improve in the medium term. However, beyond the mid-2020s growth was found to slow significantly and little change in overall access was expected. Moreover, much of

this gain was projected to come at the expense of access by car which, particularly between the mid-2020s and mid-2030s could be seen to reduce markedly.

FIGURE 13

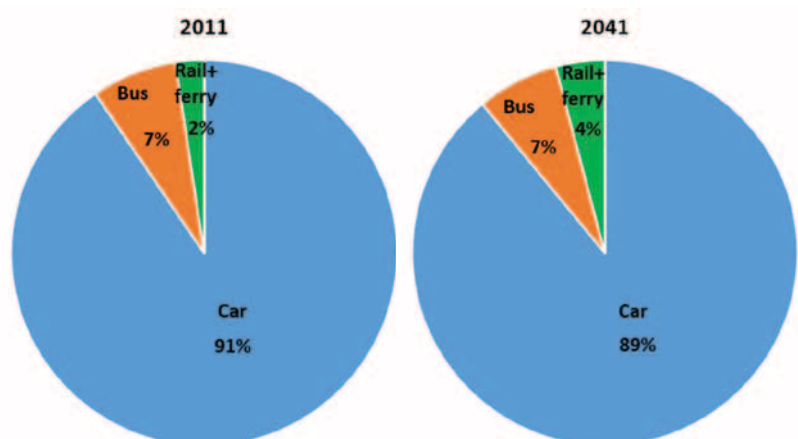
### Access to employment by public transport and car<sup>24</sup>



The overall result, forecast in the first round of ITP modelling in 2012, was that Auckland mode share in 2041 would remain more or less unchanged from today (Figure 14). This is despite a generation of investment, a compact city vision designed to improve access and concerted political emphasis all geared towards driving up public transport.

FIGURE 14

### Car and public transport person km's travelled per day<sup>25</sup>



<sup>24</sup> Auckland Council, 2015.

<sup>25</sup> NZCID from data sourced from: Auckland Transport, Auckland Integrated Transport Programme, 2012.

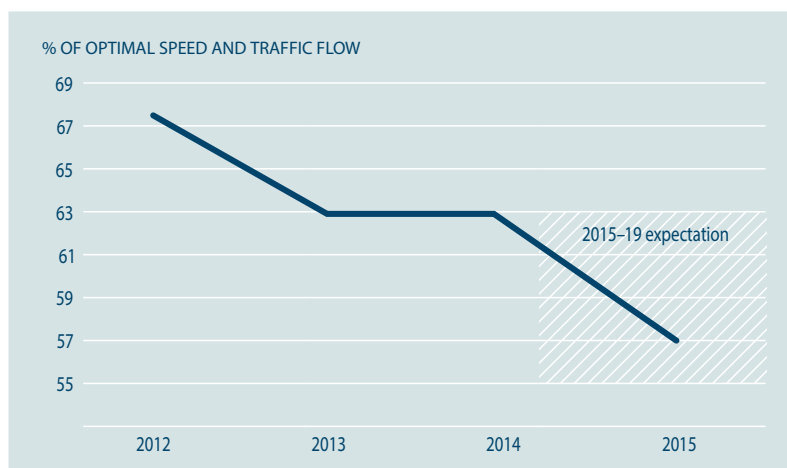
Due to the high level of expenditure on public transport assumed over the Auckland plan timeframe, relatively constant public transport mode share was not only disappointing, it suggested inefficient allocation of resources. This concern was highlighted in the low demonstrated return on investment from key Auckland Plan priorities. The top priority, for example, the City Rail Link returned a benefit to cost ratio of 0.9, or the equivalent of a loss of 10 cents for each dollar invested.

Indications that public investment in transport was returning less value was supplemented by falling user confidence in the transport system. An NZCID commissioned Horizon survey of 1000 Aucklanders in 2012, for example, found 57 per cent felt congestion was getting worse or much worse.<sup>26</sup> A 2015 Automobile Association Auckland survey panel reinforced these concerns, finding members were “deeply concerned” about an Auckland congestion situation which was “reaching crisis levels”.<sup>27</sup> An even more recent EMA survey of Auckland business members found “100 per cent dissatisfaction” with congestion<sup>28</sup> and media coverage generally is focused on a problem which is growing, not shrinking.<sup>29</sup>

Congestion and variability findings on the strategic freight network also appeared inconsistent with wider monitored network performance. The only published non-freight congestion indicators reported on by Auckland Transport – arterial road network productivity and travel times – suggested almost half the key arterial network experienced declining productivity in 2015.<sup>30</sup> NZTA analysis of the urban network during the AM peak showed an almost 10 per cent decline between 2012 and 2014, a period when modelling of the strategic network suggested mild improvement.

FIGURE 15

### Auckland urban network productivity during the AM peak<sup>31</sup>



The combination of declining value for money, a deteriorating user experience and projected expansion of congestion across the network signalled issues in the Auckland Plan transport programme. Yet, widely variable objectives across key transport agencies made it difficult to agree on priorities. Little progress was made to address differences or revisit the fundamental challenges which, if left unchecked, could evolve into major regional and national issues. It was within this context that the Government proposed a joint workstream to resolve differences and the ATAP process was born.

<sup>26</sup> Horizon Research Ltd, Transport in Auckland Survey Report, May 2012.

<sup>27</sup> AA, Auckland Matters: The AA's Auckland Infrastructure Issues Newsletter, July 2015.

<sup>28</sup> EMA, Business Plus, Issue 133 February 2016.

<sup>29</sup> For example, The Auckland, Traffic Congestion is getting Earlier, 23 November 2015.

<sup>30</sup> 53 per cent of road corridor productivity stayed the same or got better. Productivity is measured by number of vehicles and average speed, to give the percentage of the ideal flow of traffic, Auckland Transport, Annual Report 2015, p. 34.

<sup>31</sup> NZTA, Annual Report 2015, p. 48.

# ATAP

## The importance of ATAP

Recognising the need for improvements to future transport outcomes, the Government and Auckland Council agreed to establish a joint workstream to investigate options. The Auckland Transport Alignment Project (ATAP) was initiated in mid-2015 and is expected to complete its final report to responsible Ministers and the Mayor in mid-2016.

The terms of reference state that ATAP will agree the assumptions behind forecasting Auckland's transport challenge and the outcomes authorities are seeking to achieve. A variety of investment scenarios will be tested with a view to promoting the project's objectives around supporting economic growth, improving congestion, increasing public transport and delivering net benefits to users.

The ATAP process is a landmark for integrated local and central government planning and investment. Before ATAP, a range of different metrics were used by various agencies responsible for delivering a single transport system. Consequently, project priorities and perceptions of the actual challenges varied across government and were a major impediment to the achievement of transport outcomes.

Table 2 highlights the issue. It contrasts principal issues as identified in leading official transport documents. It shows that, prior to the ATAP process, no single problem was universally agreed by the various transport agencies to be holding Auckland back. Congestion and demand growth were observed in all but one of the key documents, the Regional Land Transport Plan, with other issues noted more infrequently.

TABLE 2: OFFICIAL DEFINITIONS OF AUCKLAND'S TRANSPORT PROBLEM

	Auckland Plan	Long Term Plan 2015	Integrated Transport Programme 2012	Regional Land Transport Programme 2015	NZTA Briefing to Incoming Minister 2014	Ministry of Transport Briefing to Incoming Minister 2014
Congestion	Yes	Yes	Yes	No	Yes	Yes
Lack of options	Yes	Yes	No	Yes	No	No
Demand growth	Yes	Yes	Yes	No	Yes	Yes
Safety and environmental	No	Yes	Yes	Yes	No	No
Network	No	Yes	Yes	No	Yes	Yes
Land use and/or geography impacts	Yes	No	No	No	No	Yes
Transport doesn't support land use	No	No	No	Yes	No	No
Affordability	No	No	No	Yes	No	No

The lack of consistent problem definition across transport documentation is not just an administrative issue. It has real implications for the way officials go about solving problems including what is prioritised and what is not. Figure 16 sets out the investment logic map from the latest Auckland Regional Land Transport Programme.

It is used to weight and prioritise the response of Auckland Transport, the Auckland Council and New Zealand Transport Agency to the region's transport challenges. It shows how identified problems are mapped to the benefits of solving those problems and what, therefore, public agencies will do in response.



FIGURE 16

## How problem definition impacts transport priorities<sup>33</sup>



<sup>33</sup> Auckland Regional Land Transport Plan 2015.

## Auckland's agreed objectives

Had congestion, for example, been recognised as a problem in the RLTP – as it was in all other transport documents – it is likely that the investment logic process would have resulted in different investment priorities. The weighting afforded to “moving people and goods efficiently” would almost certainly have been greater than 15 per cent and the strategic response broader. This point is especially significant given that congestion has been found to be a major issue from the 2020s and has since become a key outcome of the ATAP process.

ATAP has now addressed the major issue of inconsistent problem definition and unclear priorities. The first “Foundation” report released by ATAP in February 2016 is one of the most significant Auckland documents produced since the establishment of the Auckland Council. For the first time, central and local government authorities responsible for transport have agreed the most basic elements concerning transport.

Five objectives have been identified, together with a series of measures and KPIs to monitor authorities' performance against. These key agreed variables are set out in Table 3, but in overall terms simply formalise that congestion and public transport must be improved effectively and efficiently.

TABLE 3: ATAP AGREED OBJECTIVES<sup>34</sup>

Objective	Measure	Headline KPI
Improve access to employment and labour	Access to employment and labour within a reasonable travel time	<ul style="list-style-type: none"> <li>Jobs accessible by car within a 30-minute trip in the AM peak</li> <li>Jobs accessible by public transport within a 45-minute trip in AM peak</li> <li>Proportion of jobs accessible to other jobs by car within a 30 minute trip in the inter-peak</li> </ul>
Improve congestion results	Impact on general traffic congestion	<ul style="list-style-type: none"> <li>Per capita annual delay (compared to maximum throughput)</li> <li>Proportion of travel time in severe congestion in the AM peak and inter-peak</li> </ul>
	Impact on freight and goods (commercial traffic) congestion	<ul style="list-style-type: none"> <li>Proportion of business and freight travel time spent in severe congestion (in the AM peak and inter-peak)</li> </ul>
	Travel time reliability	<ul style="list-style-type: none"> <li>Proportion of total travel subject to volume to capacity ratio of greater than 0.9 during AM peak, PM peak and inter-peak</li> </ul>
	Increase vehicle occupancy	<ul style="list-style-type: none"> <li>Average vehicle occupancy</li> </ul>
Increase public transport mode share	Public transport mode share	<ul style="list-style-type: none"> <li>Proportion of vehicular trips in the AM peak made by public transport</li> </ul>
	Increase public transport where it impacts on congestion	<ul style="list-style-type: none"> <li>Proportion of vehicular trips over 10km in the AM peak made by public transport</li> </ul>
Increased financial costs deliver net user benefits	Net benefits to users from additional transport expenditure	<ul style="list-style-type: none"> <li>Increase in financial cost per trip compared to savings in travel time and vehicle operating cost</li> </ul>
Ensure value for money	Value for money	<ul style="list-style-type: none"> <li>Package benefits and costs</li> </ul>

<sup>34</sup> Auckland Transport Alignment Project Foundation Report Feb 2016.

## Auckland's agreed transport problems

In addition to agreeing the objectives for the Auckland transport system, ATAP also aligned central and local government assumptions around growth and other critical variables. The result is the most robust problem definition yet developed. It is also the most concerning.

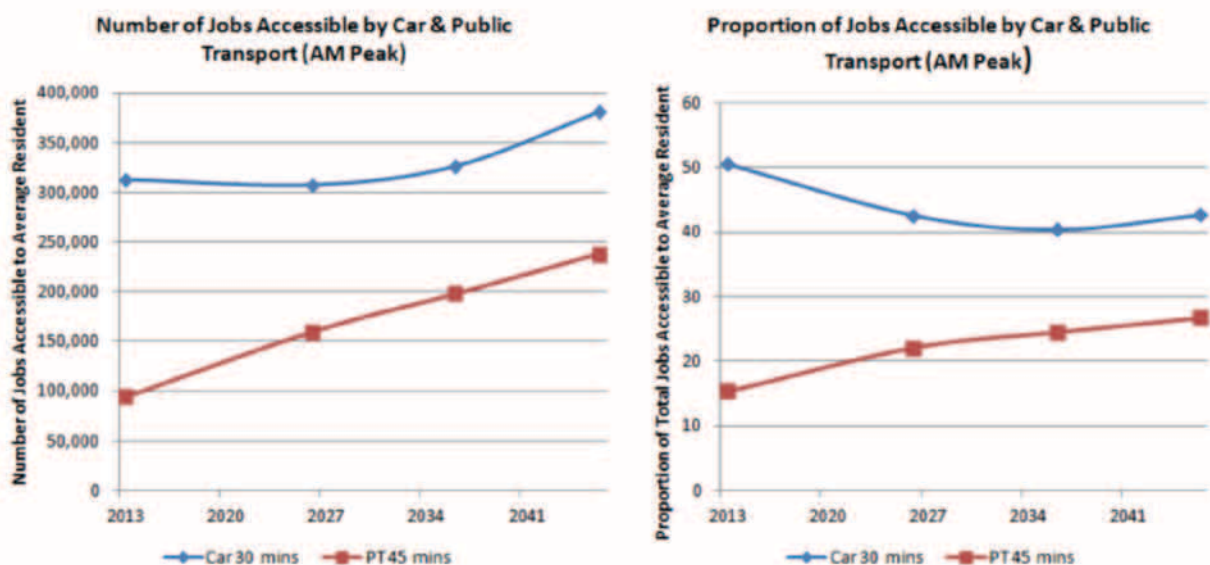
### Access to employment and labour is mixed

ATAP analysis indicates that over the next decade-and-a-half, access to employment by private vehicle will reduce. The decline is most noticeable in relation to the proportion of jobs, but is even true in relation to the number of jobs. Given the large increase in the absolute number of positions across Auckland, that fewer residents will be able to access employment within a 30 minute commute indicates congestion will take a heavy toll on opportunities to work. Positively, results improve beyond 2030, eventually seeing both the number and proportion of jobs accessible within a 30 minute commute improve from the mid-2030s.

The decline in accessibility by car is to some extent off-set by improvements in accessibility by public transport. Constant increases over the forecast period will eventually see 2.5 times as many jobs within a 45 minute commute. The proportion of jobs accessible by public transport will grow more slowly, particularly post 2027, but almost twice the share of jobs will be accessible by public transport following implementation of the current plan.

FIGURE 17

### ATAP access to employment<sup>35</sup>



35 Auckland Transport Alignment Project Foundation Report Feb 2016.

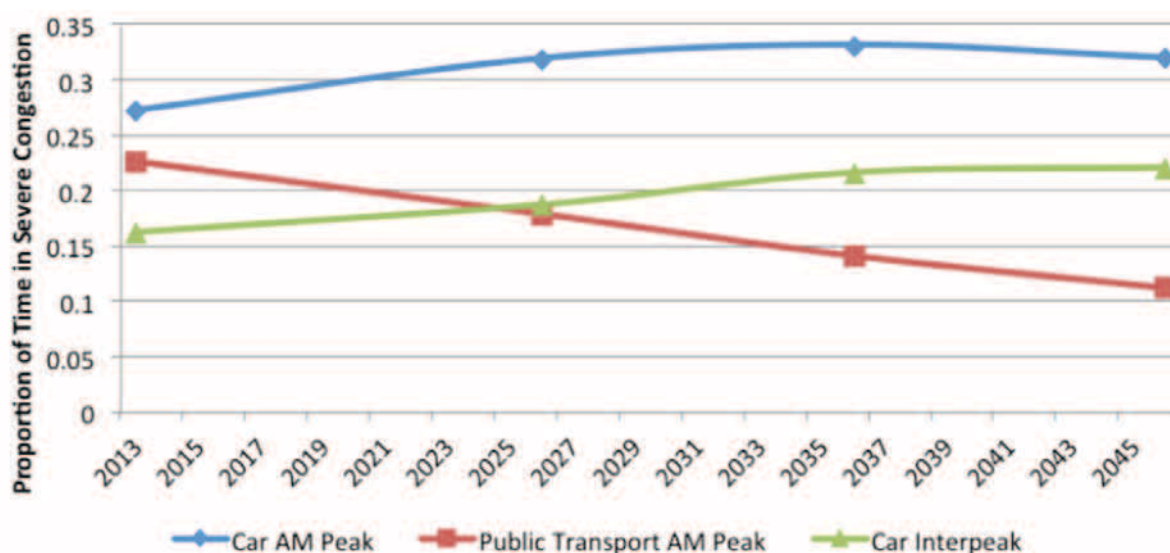
Nevertheless, public transport employment accessibility improvements of around 13 percentage points are expected to be substantially offset by a decline in car access of around 8 percentage points. Early-term car accessibility and late-term public transport access are areas of real concern. Efforts to improve access to employment and labour by public transport are simultaneously resulting in reductions via car, reinforcing evidence that congestion is becoming a major issue.

### Congestion gets worse

The outlook for congestion is poor. Far from addressing the existing congestion concerns of residents and businesses, implementation of the Auckland Plan programme will see severe congestion worsen. In 2046, general traffic through the morning peak will experience around 20 per cent more severe congestion than today and, through the interpeak, closer to 25 per cent more (Figure 18).

FIGURE 18

#### Projected Severe Congestion 2013-2046<sup>36</sup>

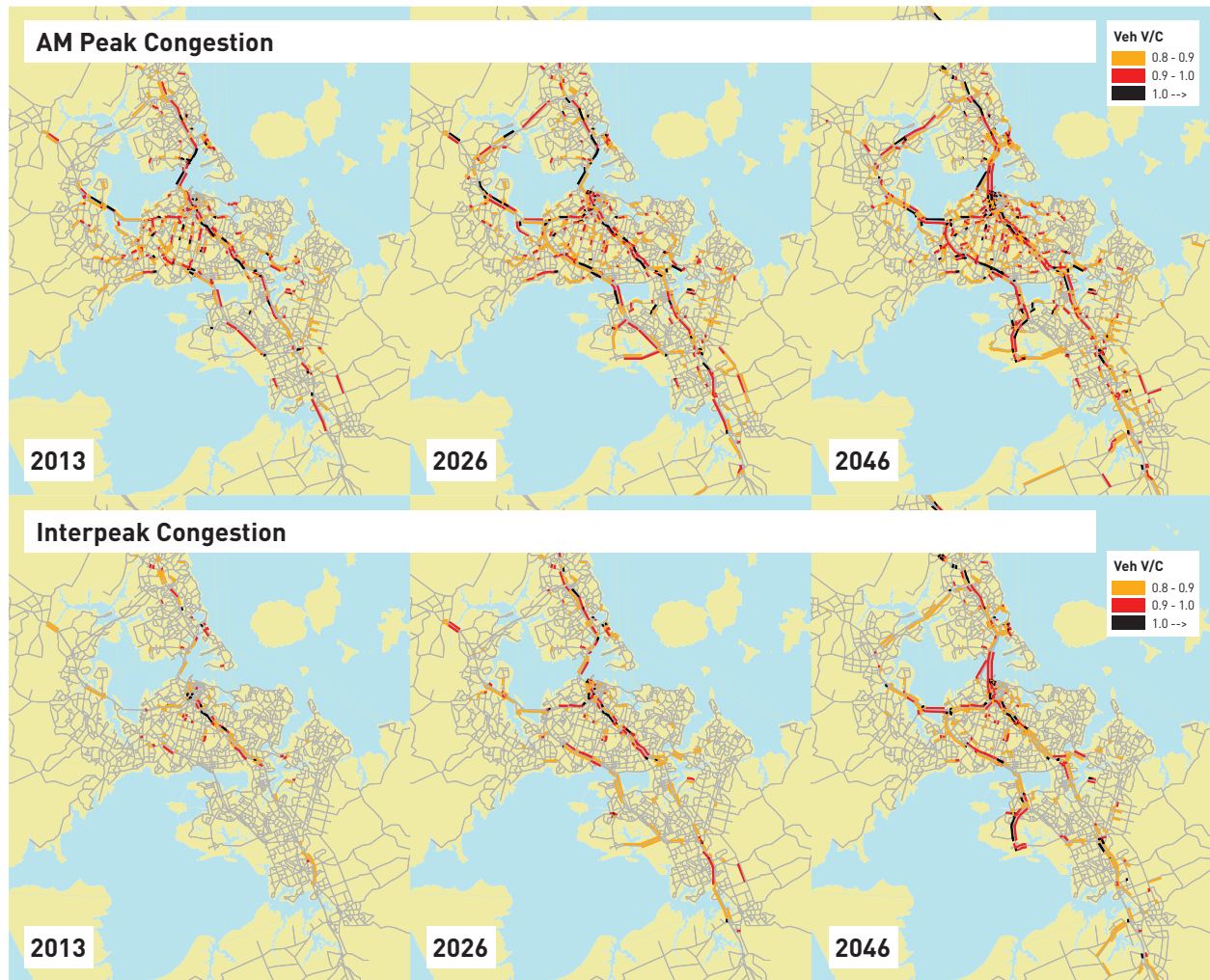


Positively, severe congestion affecting morning buses is expected to steadily decline throughout the forecast period and across most measures in the 2040s. The general improvement to 2046 is welcome, but also highlights the opportunity open to ATAP to reprioritise investments. Some of the priorities currently planned for later in the forecast period may be able to be brought forward to realise benefits sooner and less effective projects deferred.

36 Auckland Transport Alignment Project Foundation Report Feb 2016.



FIGURE 19

ATAP congestion modelling<sup>37</sup>

Even with project reprioritisation via ATAP, expectations are that congestion will worsen. Of note, “severe” congestion (vehicle volume to capacity of 0.9 and above) analysis understates the true extent of the problem. At volume to capacity levels above 0.9 it is extremely difficult to increase the number of vehicles using a road. The observable result across the network is that demand shifts onto adjacent corridors and to earlier and later periods, spreading “congestion” (defined as a vehicle volume to capacity ratio of 0.8-0.9) across the network and throughout the day (Figure 19).

The magnification of congestion throughout the day is of particular concern. By 2046, congestion on the motorway network will be as bad through the entire interpeak (9am-4pm) as it is today during the morning peak (7am-9am). All day gridlock along the length of State Highway 1 and across much of state highways 16 and 20 will see commercial traffic increasingly divert onto local roads. This will have a serious negative impact on Auckland’s productivity and liveability.

<sup>37</sup> Auckland Transport Alignment Project Foundation Report Feb 2016.

## Public transport grows - moderately

ATAP's analysis of public transport growth is concentrated on morning peak travel. In this regard, the Auckland Plan programme arguably performs the best against ATAP metrics. Patronage will grow throughout the forecast period, including an impressive doubling (from 7 to 15 per cent) of morning peak mode share. If the actual amount of morning travel met by public transport is measured (i.e. personal distance travelled), this number increases further, to 19 per cent.

However, it is not clear from published ATAP research whether this share of the transport load is appropriate given the level of investment in public transport. The Auckland Plan vision, political emphasis and projected funding allocations are not predicated on morning peak services, but a transformational shift to public transport overall. The morning peak, furthermore, is the period in which public transport enjoys its greatest comparative advantage with private vehicles (due to congestion slowing car travel and increased services benefitting patronage).

If public transport only meets 20 per cent of total transport need in the morning peak, it is reasonable to assume it will meet significantly less overall. The Foundation report does not investigate public transport mode share outside the morning peak, but does note that through the interpeak patronage is less due to the distributed nature of trips.

FIGURE 20

### Mode share for all trips (AM peak)<sup>38</sup>

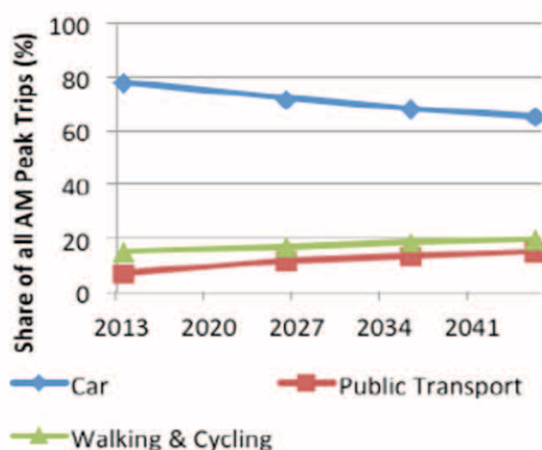
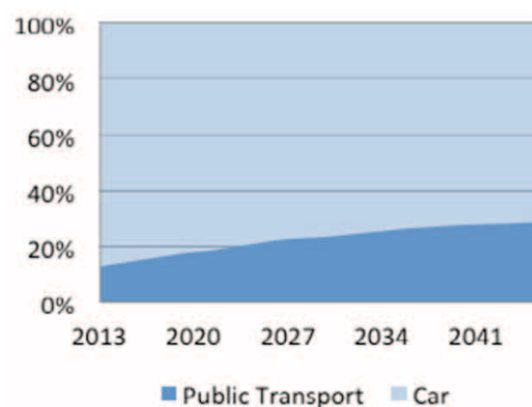


FIGURE 21

### Vehicular mode share for journeys to work (AM Peak)<sup>39</sup>



<sup>38</sup> Auckland Transport Alignment Project Foundation Report Feb 2016.

<sup>39</sup> Auckland Transport Alignment Project Foundation Report Feb 2016.

## ATAP will improve outcomes but is limited

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### There is a risk that added costs will not result in net user benefits

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The Foundation report does not provide analysis of the value for money of different policy and intervention programmes, including those with a road pricing component. ATAP does, however, highlight the need for any combination of options to result in a net benefit to users. There remains a risk with a demand management tool like road pricing, or indeed other options including restrictive parking policies, that the transport benefit gained from a policy perspective is not representative of the benefit felt by the businesses, residents and users of the transport network in Auckland.

For example, high motorway tolls and the removal of parking facilities could see congestion completely removed from parts of the network, albeit with significant impacts on the ability for users to get around Auckland. ATAP has acknowledged the need for these initiatives to lead to a better quality of life and more economic activity, rather than suppressing demand.

That ATAP has acknowledged existing transport projections are problematic is a major step forward and has been universally welcomed.

The significance of identifying and agreeing key objectives, in particular, should not be underestimated. Without a firm cross-agency understanding of what the transport system is going to deliver, even agreeing what the problem is currently can be difficult. Now it is known what should be the outcome, various intervention packages can be tested and a heightened focus can be brought to solving Auckland's most vexing problems.

Nevertheless, some practical limitations have been placed on the ATAP process in order to make progress in the near term. These constraints will moderate ATAP's ability to deliver a truly effective transport system:

### Modest objectives

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ATAP's Terms of Reference indicate that the purpose of the programme is to improve alignment over the way Auckland's transport system should develop. Although the initiative includes provision for identifying common objectives, there is no expectation nor requirement that ATAP will achieve targets relating to these objectives. The only requirement is that the concerning performance of the current programme is improved.

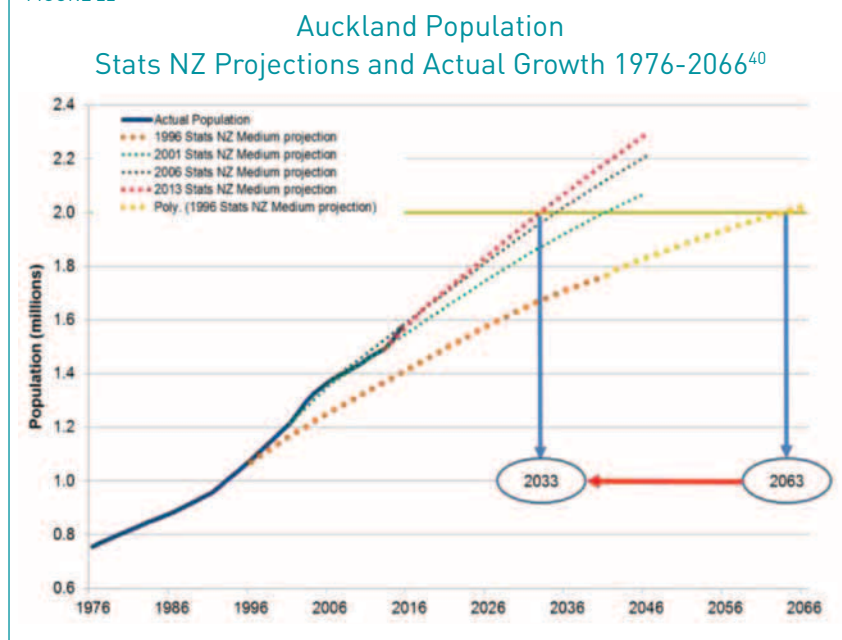
Targets which reflect user expectations for the transport system could be identified, pursued and traded off appropriately via the ATAP process. The costs of and measures required to meet accessibility, congestion and public transport targets should be a part of the evaluation process. Bottom lines for congestion, as the most sensitive and general gauge of how well the transport system is operating, should be identified. For example, a minimum level of service for the interpeak should be identified which ensures traffic is moving across the strategic freight network at all times, as indicated by a volume to capacity ratio no greater than 0.7. A programme should be developed which ensures this target can be met.

## Assumptions are already under pressure

In order to predict travel demands into the future, one of the most fundamental assumptions concerns population growth. Through ATAP, officials have agreed to use Statistics New Zealand “medium” growth projections. This follows a high degree of criticism directed towards the Auckland Council in its preference of “high” growth assumptions in the Auckland Plan, which were felt by many to exacerbate issues rather than provide capacity. The preference for “medium” growth can therefore be understood and is no less accurate than a high growth forecast, but it also immediately establishes transport demand assumptions at the lower extreme.

Auckland’s actual growth experience, both subsequent to the GFC and before it, is for growth to track along the “high” forecast. If Auckland does indeed grow at its historical “high” rate, Auckland’s 1.5 million residents in 2013 will grow not just to the medium projection of 2.23 million, but to 2.43 million – an additional 200,000 residents. This means Auckland will have to accommodate a population the size of Wellington City in addition to the 700,000 new residents expected.

FIGURE 22



Travel demand can be expected to increase in proportion to population. That is, pressure on networks is likely to be up to 10 per cent greater than assumed through ATAP by the mid-2040s. When Auckland Transport last modelled high growth projections, through the Integrated Transport Programme 2012, the results were sobering. Congestion on the strategic freight network during the interpeak as well as regional transport delay were projected to both increase by a factor of almost five and officials consequently concluded:

the levels of congestion forecast for Auckland by 2041 are well in excess of the current levels experienced in cities such as Sydney and Melbourne, which already have considerably larger populations.<sup>41</sup>

ATAP should sensitivity test scenarios using high growth assumptions and examine whether this has any impact on not only the timing, but also the sequencing of projects. Results should be published as an indicator of the pressure likely to be faced if Auckland continues to track along a high growth trajectory.

<sup>40</sup> Auckland Council.

<sup>41</sup> Auckland Transport, Auckland Integrated Transport Programme 2012, p.16.

## KPIs are limited

ATAP has agreed the key performance indicators that will be used to evaluate the relative merits of different investment programmes. These metrics are weighted towards narrow economic indicators at the expense of wider measurements of congestion's impact on users.

More emphasis is placed on morning peak metrics, for example, than the evening peak, even though evening peak traffic arguably bears more heavily on quality of life. While morning traffic may require commuters, in particular, to spend more time travelling, evening peak traffic can prevent residents from accessing after work and school activities.

Likewise, there are no metrics identified for weekend traffic. Auckland's accessibility to the natural environment and extra-curricular activities through non-work periods is a key component of its liveability. Apart from restricting access to activities such as children's sport, weekend congestion undermines the attractiveness of Auckland to labour and investment and should be measured.

The issue is not limited to congestion. Public transport KPIs are exclusive to morning peak. This suggests some degree of recognition or expectation that public transport is solely a journey to work mode. The Auckland Plan, on contrast, is predicated on a reorientation of mode choice away from private vehicles more generally. If public transport provision is geared almost completely towards morning peak travel, congestion indicators off peak are important to understanding the capacity of the network to meet travel demand.

Other KPIs are more closely associated with "inputs" which, while often a key contributor to desirable transport outcomes are, nevertheless, not prerequisite. Average vehicle occupancy, for example, is a variable which may result in less pressure on road networks but in and of itself is not sufficient to ensure mobility. Greater emphasis should be placed on those metrics which represent real benefits to users of the transport system, including through evening and weekend periods.

Metrics that would help rebalance ATAP's overall assessment of different investment packages include:

- Proportion of traffic exposed to VCR 0.7 and above
- Proportion of traffic subject to VCR 0.7 and above on weekends
- Proportion of travel time in severe congestion in the PM peak
- Public transport mode share overall

## Timeframes are fixed

Further limiting the role of ATAP is the focus on fixed time horizons. Although in practice modelling requires input dates, a core responsibility of transport authorities should always be to look through these dates to ensure that the network they are planning is capable of meeting the needs of transport users far into the future. The years 2056 and even 2096 are as important as 2046 from a long term network sustainability perspective.

A declared objective of ATAP should be to ensure a degree of robustness in transport forecasting which ensures the Auckland transport network is capable of responding to growth beyond 2046. A major reason why Auckland has been able to lift transport performance over the past decade and why performance looks likely to decline over the coming decade is because of decisions made (or not made) half a century ago to protect infrastructure corridors and services for future use.

ATAP should identify future transport corridors for designation and protect those corridors from development. This is a standard activity in transport planning globally, but has been increasingly neglected in recent decades.



## Public expectation is for an improvement on today

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### ATAP is a transport only evaluation

ATAP is a transport-only evaluation of planned investments based on a constrained land use pattern. It is focused on “supply” or “response” side interventions, with a single demand management component via a motorway tolling mechanism. Transport measures, however, are only one half of the transport equation. The other half is the demand for transport, principally generated by land use. Land use and urban design decisions – past, present and future – shape transport choices and determine how much road, public transport and other mode demand there is and when. In any environment where resources must be prioritised, they are as important to determining transport outcomes as the roads, railways and footpaths which constitute transport infrastructure.

As a time-constrained transport evaluation and not a re-litigation of the Auckland Council’s growth vision, ATAP has inherited the Auckland Plan land use scenario. The assumption, modelling and evaluation of a single land use scenario through ATAP prevents a full spectrum review of transport outcomes and performance. If land use is or becomes a significant factor in the generation of travel needs which cannot be met by any transport package, ATAP will not be able to deliver the magnitude of benefits businesses, residents or the Government require from the Auckland transport system.

As important as the necessary containment of the ATAP study to short term deliverables is, perhaps the biggest challenge facing officials exists outside the entire process. The public’s expectations of just what Auckland’s transport system should deliver are higher now than in the past. Successive leaders have used public transport and congestion issues to rally political support and justify far-reaching social and political reforms. Amalgamation, densification, road tolls, rates increases and other major initiatives have been predicated not on moderating poor transport outcomes but solving Auckland’s transport issues.

It is unlikely that the public will settle for results, following a generation of heavy investment and radical urban reform, which are markedly worse than today’s unacceptable conditions. Congestion in particular, because of its tendency to absorb and reflect issues elsewhere in the transport system, is an especially tangible metric for users of the transport system. Congestion across Auckland must be noticeably improved from today’s unacceptable levels in order for the expectations of the region and nation to be realised.

History shows this is possible. With the completion of the Western Ring Route, Auckland will experience congestion, accessibility, variability and public transport performance in general better than in 2006, thanks to a sequence of high quality transport decisions. Public expectation built off a compelling evidence base is that public transport services will continue to expand and that this expansion will lead to a reduction in demand for road space which in turn will reduce congestion. Authorities can and must ensure this level of success is replicated in coming decades. Achieving this, however, requires an understanding of the most fundamental issues holding Auckland’s transport system back and addressing those issues.

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# Why is congestion getting worse?

ATAP analysis shows that the most immediate transport issue for Auckland is congestion. Public transport, both in terms of mode share and accessibility, may not be performing to its potential, but is improving in line with policy. Congestion is not. It is expected to get progressively worse following completion of the Western Ring Route until the 2040s when there is expected to be some comparative improvement. At no point will congestion become better than today's unacceptable levels.

## A lot is being done

Figures 4 and 5 above indicate that authorities have committed and are proposing to continue to commit very substantial amounts to transport in Auckland, indefinitely. These amounts are high by historic and by international standards.

Given past underinvestment in the system, high future spending is not a guarantee resourcing is sufficient, but it does suggest the quality of spending should be closely evaluated before new spending is allocated. Analysis of the investment programme immediately highlights opportunities to better target congestion.

## Demonstrated transport benefits from investment priorities is low

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Economic evaluation of key transport projects reveals that the benefits of investment is in some important cases substantially less than what is normally expected. The CRL, for example, returns a commonly cited benefit-cost ratio (BCR) of 0.9, indicating that 90 cents of real benefit will be derived from each dollar invested over a term of 30 years. AMETI's BCR of around 1.0 indicates no real return on investment and the East-West Connections project, which delivers the strongest return of the top Auckland Plan priorities, delivers just \$1.20 for each dollar spent (using the equivalent methodology of a 30 year timeframe and 8 per cent discount rate). The proposed Additional Waitemata Harbour Crossing performs the worst economically, delivering a BCR of 0.4.

However, while these approximations of the total benefit these projects will provide in comparison to their total costs are poor, their actual transport benefit is in some cases much lower. Not well understood outside of arcane transport circles is that the assessed benefits of a transport project are comprised of two broad components: transport and wider economic benefits. Transport benefits gauge a project's impact on safety, operating costs and travel times (by improving journey times and taking cars off the road for public transport, walking and cycling, or by increasing flows on roads). Wider economic benefits make provision for other demonstrable impacts that transport is known to have on economic efficiency, such as by improving competitiveness and overall productivity (agglomeration).

Wider economic benefits provide a critical view of what a transport investment is worth to the economy, but not what it is worth to transport users. In fact, with respect to congestion, travel time savings are by far the most important measure of impact and, except on particularly dangerous roads, tend to make up the majority of demonstrated benefit on transport proposals.

## Public transport is not reducing private vehicle demand

Focusing specifically on demonstrated transport benefits, key Auckland project priorities deliver much lower value than often cited. Most notably, the BCR for the CRL is 0.4 and the harbour crossing is under 0.3. Although billion dollar-plus “mega-projects” almost always underperform on cost-benefit analysis these returns on investment are extremely low.

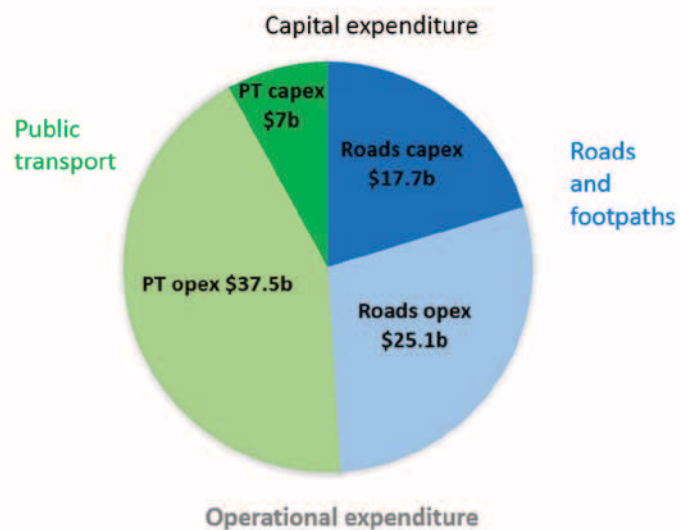
Given that these two projects alone comprise some \$7 billion of public investment and represent half the current transport funding shortfall, their low demonstrated benefit has a material impact on overall transport outcomes. If that same amount of money was reallocated to projects delivering a higher economic benefit, significant travel time savings and other benefits could be achieved with long lasting, region-wide impacts on congestion.

This is not to say that these “city-shaping” mega-projects should be replaced by hundreds of small projects delivering demonstrated congestion benefits. Not captured in the analysis of major projects is their impact on long term land use and transport habits, for example. However, the performance – measured and unmeasurable – of very expensive key priorities does provide one avenue for improving transport outcomes through the ATAP process.

Major project investment is not the only area suggesting the quality of investment is low. Expenditure in general points to reducing effectiveness for each transport dollar spent. As illustrated in Figure 23, approximately half of all Auckland Council managed transport spending over the next 30 years is committed to public transport.

FIGURE 23

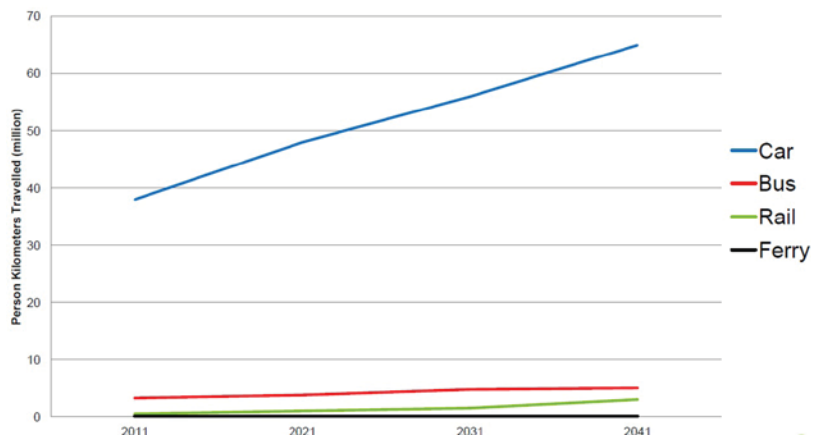
### Auckland Council 30yr transport investment<sup>42</sup>



This quantum of investment should meet a significant share of overall transport demand. Yet only around 11 per cent of vehicle person kilometres travelled, just marginally up on 9 per cent today, are projected to be carried by public transport in 2041 (Figure 14). The increase in rail patronage following a tectonic shift in investment for a generation will see some 2 million more person kilometres travelled each day. Car person kilometres travelled, meanwhile, are expected to increase by 27 million kilometres per day. Mode share dominance remains heavily oriented to private vehicles even while resources shift to public transport.

42 NZCID from Auckland Council LTP, v.2, p. 38.

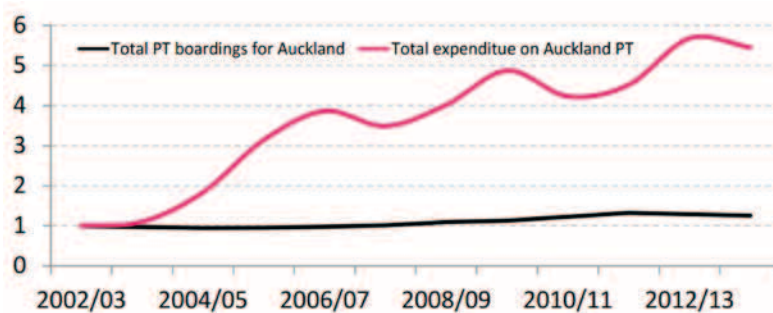
FIGURE 24

Daily person kilometres travelled 2011-2041<sup>43</sup>

Decades of investment in road services mean it is not realistic to presume public transport will within 30 years carry a load proportionate to its third or more share of transport spending, but growth from 9 to 11 per cent is very low. Real comparative increases in spending without commensurate rises in mode share means investment efficacy is reducing.

The declining impact of public transport investment is illustrated in Figure 25. It shows that between 2002 and 2012 an increasingly large amount of money was spent on public transport for limited gains in mode share. NZIER have calculated that a 470 per cent increase in public transport spending between 2002 and 2012 increased public transport use by just 30 per cent. ITP modelling suggests that this trend of increasing spending for marginal benefit is not a temporary but a permanent feature of the Auckland Plan programme.

FIGURE 25

Auckland Public Transport patronage and expenditure growth (2002 = 1)<sup>44</sup>

<sup>43</sup> NZCID from data provided in ITP 2012.

<sup>44</sup> NZIER from NZTA data.

## Local roads are absorbing travel demand, but not resources

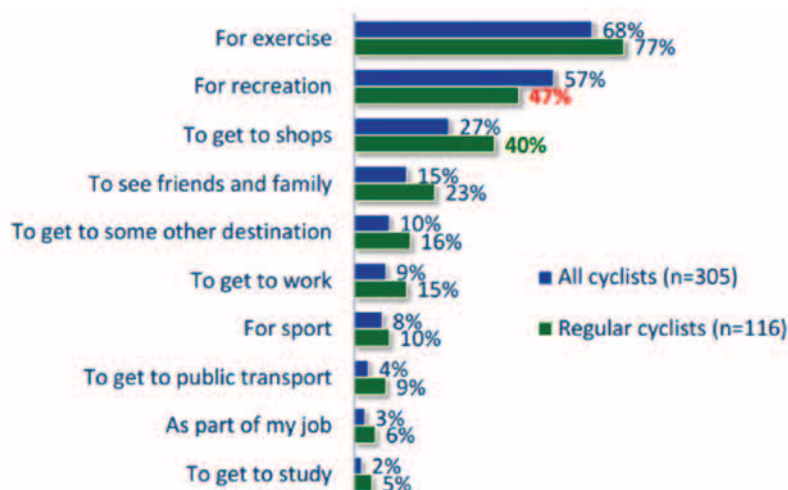
In contrast, a similar amount of money is projected to be committed to local roads, but apparently to greater effect. Local roads provide for 65 per cent of vehicle kilometres travelled and vehicle kilometres comprise around 90 per cent of all motorised person kilometres. This suggests that local roads, conservatively, will in the 2040s support over half the region's overall motorised transport demand, compared to around 10 per cent for public transport, despite equivalent spending for over three decades. In addition, local road allocations cater for walking and cycling and include provision for retaining roads as utility corridors.

### Cycling also consuming resources

Public transport is not the only measure of alternatives to private vehicles where value for money is an issue. Over \$200 million is earmarked for cycling improvements, including an additional 53km of track in the next three years.<sup>45</sup> The growth in trips resulting from this investment, while significant year-on-year, is small in relation to transport demand. By 2025 fewer than 9 million cycle trips are expected to be undertaken, compared to the 140 million by public transport targeted for 2022. Furthermore, the majority of these, evidence suggests, are not 'transport' related, but are undertaken for recreational and exercise purposes (Figure 26).

FIGURE 26

#### Reasons for riding bicycle<sup>46</sup>



<sup>45</sup> Auckland Council.

<sup>46</sup> Auckland Transport Cycling Research 2013.

## Proposals to increase density are concentrating vehicle traffic

Private vehicle growth will occur within an urban area which expands much more slowly. Comparatively tight restrictions on expanding Auckland's urban limits and ambitious targets including 70 per cent of all growth inside the existing metropolitan area will lead to an increase in the concentration of vehicles. Higher concentrations of vehicles will materialise as congestion unless sufficient capacity is present in the system.

The additional pressure density places on congestion can be seen in Figure 27. It maps the overall congestion factor of all 146 "large" (800,000 population and above) global cities measured by Tomtom against the density of those same urban areas. Auckland, highlighted in red, has a congestion rating of 32, indicating a free-flow 100 minute car trip will take on average 132 minutes, and an urban density of 2500 residents per square kilometre. Figure 27 shows the tendency for congestion to increase as density increases. The correlation measured is 0.69 and is statistically significant.



FIGURE 27

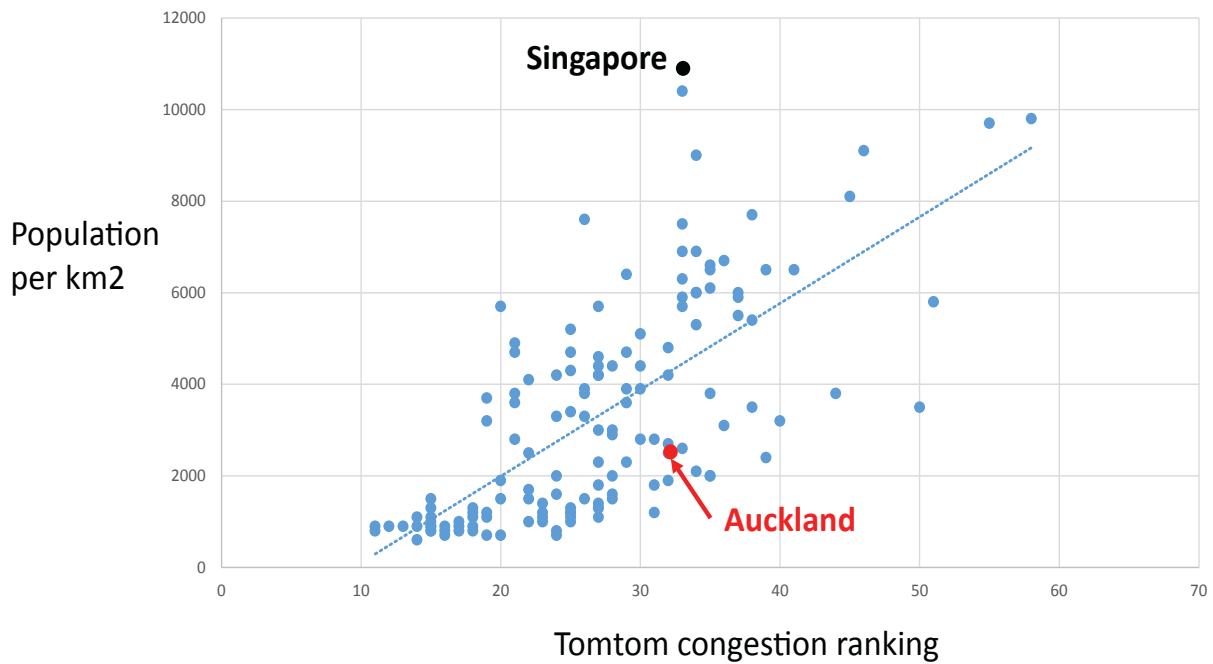
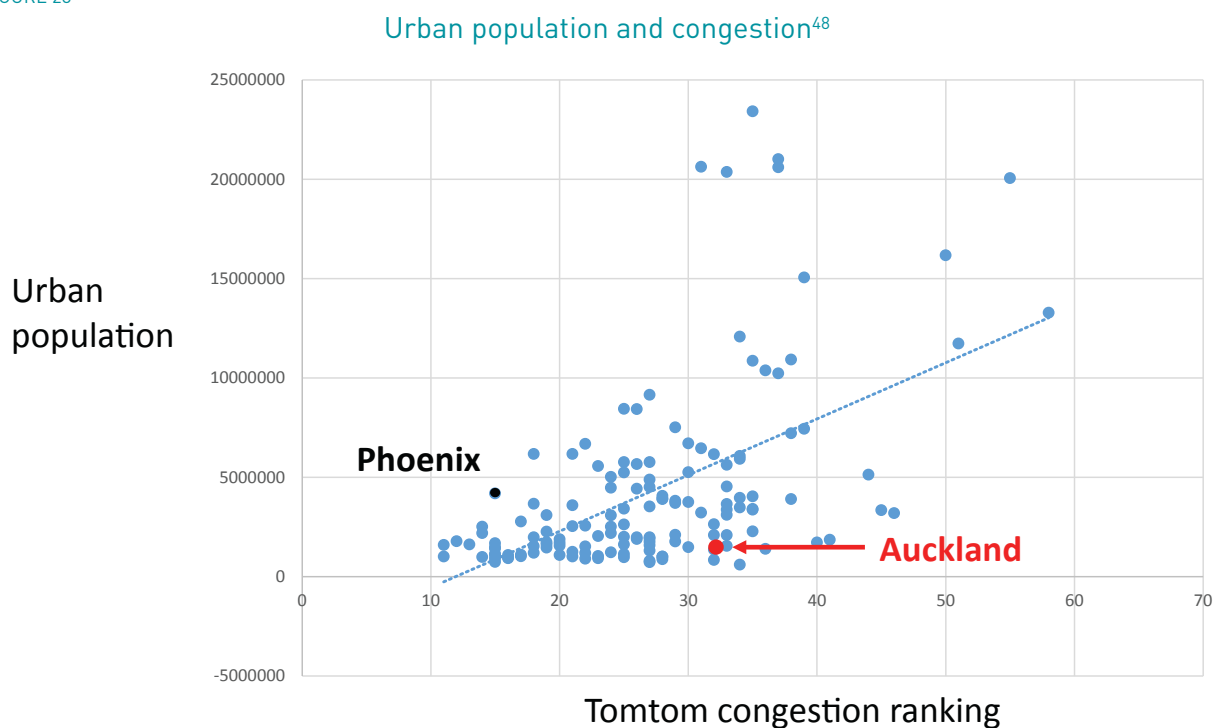
Urban densities and congestion<sup>47</sup>

Figure 27 also suggests that Auckland's congestion levels are consistent with a much more dense city. That is, the efficiency of Auckland's transport system is already an issue in comparison to other urban areas. Some cities, notably Singapore, achieve similar congestion performance with much higher densities because the network can sustain demand (which in Singapore is managed) through busy periods.

The relationship between congestion and density can be contrasted against the relationship between density and population. Figure 28 presents the correlation between urban population and congestion. It also shows that, as population grows, so too in general does congestion (a statistically significant correlation of 0.49). Although it is difficult to conclude from this information that density is of greater significance than population, differences in the data do indicate that density has an impact which is independent of population size.

<sup>47</sup> Tomtom and Demographia.

FIGURE 28



In Figure 28, Auckland can again be seen to underperform in congestion measurement relative to similar sized cities. Congestion in Auckland is not an outlier, but it is twice as bad as many cities of a similar size and is suggestive of an urban area with a population up to four times as large. A city like Phoenix, for example, with over 4 million residents and growing, enjoys much less congestion. This indicates that congestion should not be accepted as a natural byproduct of a large city nor a successful city.

Neither population size nor density level requires that a city will be congested. Indeed, the variation in both graphs suggest that other factors such as geography and wealth play important roles in determining how congested world cities are. For some cities it could also be the case that they are not more congested because they are dense but are more dense because they are congested (that is, residents move closer to activities to minimise exposure to congestion).

However, for the majority of cities, it is clear that increases in density place upward pressure on road networks. Unless this is offset by service level improvements in the transport system, traffic conditions will deteriorate.

<sup>48</sup> Tomtom and Demographia.

## Auckland's road network is constrained

Increasing Auckland's road network, however, is extremely challenging. Global analysis indicates that Auckland's street pattern and provision of space for travel already falls far short of that seen in comparable cities and cannot easily accommodate growing demand.

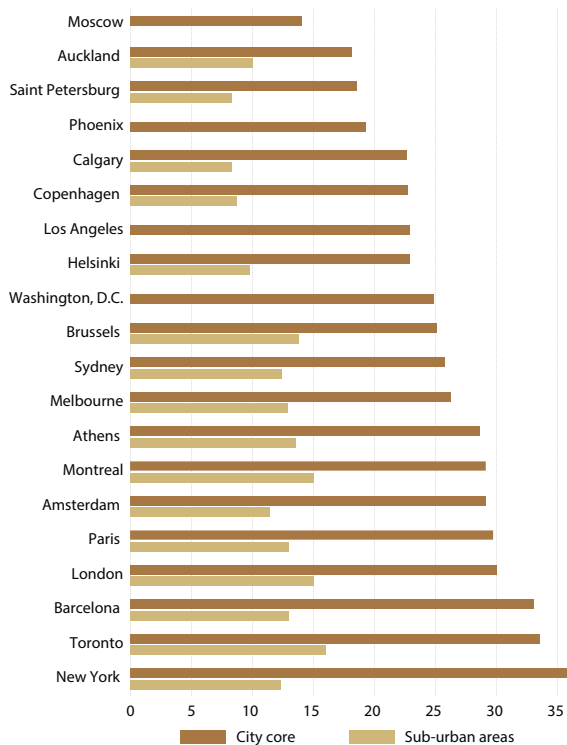
Figure 29 from a 2013 United Nations report highlights some of the constraints facing Auckland. Historic decisions have left the city with a comparatively small amount of

land dedicated to streets. Of the cities examined, only the chronically congested Moscow has committed a smaller proportion of its land to facilitating movement. The lack of street space means not only that roads possess less capacity to move vehicles, but that alternate modes, including walking and cycling, are either limited or consuming lane capacity otherwise available to move private vehicles.

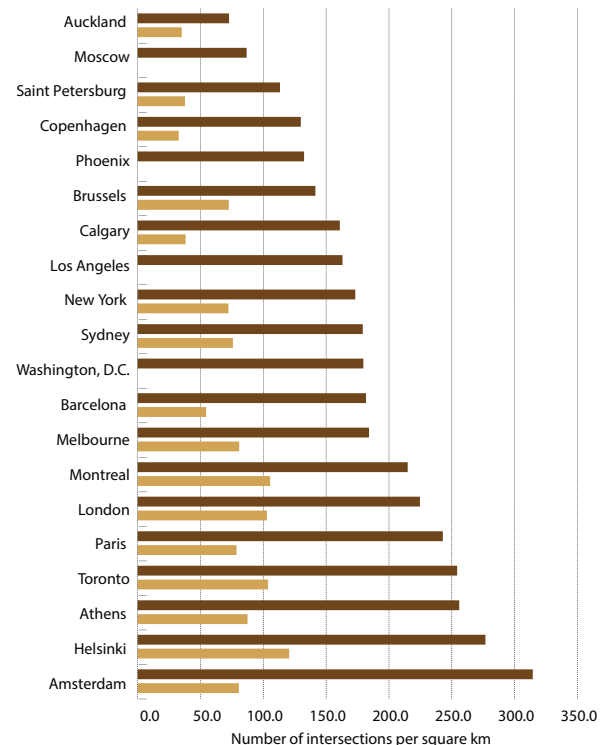
FIGURE 29

### Auckland's road network is constrained<sup>49</sup>

LAND ALLOCATED TO STREET (LAS) IN CITIES, EUROPE, NORTH AMERICA & OCEANIA



INTERSECTION DENSITY IN CITIES EUROPE, NORTH AMERICA, OCEANIA



It is not only the allocation of land for transport which constrains movement. The street pattern itself is not conducive to meeting high travel demands. Auckland has a small number of intersections, relative to other cities, which the authors tie to reduced attractiveness for walking.

Limited walking options are an impediment to public transport uptake, as well as walking as a travel mode in itself. With alternate modes limited, travel needs must be met by private vehicle, even while congestion worsens.

49 UN Habitat, Streets as Public Spaces and Drivers of Urban Prosperity, 2013.

## Strategic capacity is already an issue

The absence of capacity on Auckland streets and footpaths to facilitate movement increases the importance of capacity on the strategic road network – Auckland’s motorway system. However, far from being in a position to accommodate growing travel needs, the Auckland motorway system is already under extreme pressure.

ATAP modelling (Figure 19) shows that critical parts of the Auckland road network are already over capacity throughout the day. That is, not only are corridors gridlocked by commuters during the mornings and evenings, the network cannot even accommodate demand through the commercially important interpeak period.

This leaves parts of State Highway 1 congested from before 7am to after 6pm on a weekday basis. Although new capacity via the Western Ring Route will improve conditions in the near term, ATAP analysis shows that by 2036 the motorway system through the interpeak will, under the current programme, be worse today than during the morning peak.

The network at present or even as planned was never designed for the volumes of traffic seen today. In fact, the original motorway plan for the region was predicated on not just the western ring route being completed by 1986, but the eastern corridor as well. Thirty years later, the extent of the network is barely half what was envisioned.

FIGURE 30

### 1965 De Leuw Cather Highway Network vision for 1986



The comparative decline of Auckland’s once ambitious motorway system, which for half a century has enabled the city to function in spite of deferred investment and poor public transport, can be seen in comparison to other liveable cities. Figure 31 superimposes to scale the motorway networks of various comparable metropolitan areas with populations between Auckland’s existing 1.5 million and its 2045 future of up to 2.5 million (Brisbane, Portland, Vienna and Vancouver each have urban populations of around 2.3 million, Zurich around 1.8 million). In all cases, the motorway networks today are more comprehensive than Auckland’s is projected to be in 2045.<sup>50</sup>

<sup>50</sup> Motorway networks are at least two-lanes in each direction and grade separated. Maps do not reveal the number of lanes with particularly European motorways tending to be smaller (two-lanes in each direction).

FIGURE 31

### Liveable city motorway networks



The limited reach of Auckland's strategic road network in comparison to the city's international competitors is not the only problem. Disproportionate dependency upon several key parts of the network where capacity is constrained has ripple effects across the entire transport system. Pinch points around the CBD, Mt Wellington and Greville Rd compress traffic, stymieing movement many kilometres away throughout busier periods. Although Greville Rd is now being addressed, there are no plans in the next thirty years to address capacity issues at either Mt Wellington or around the CBD.

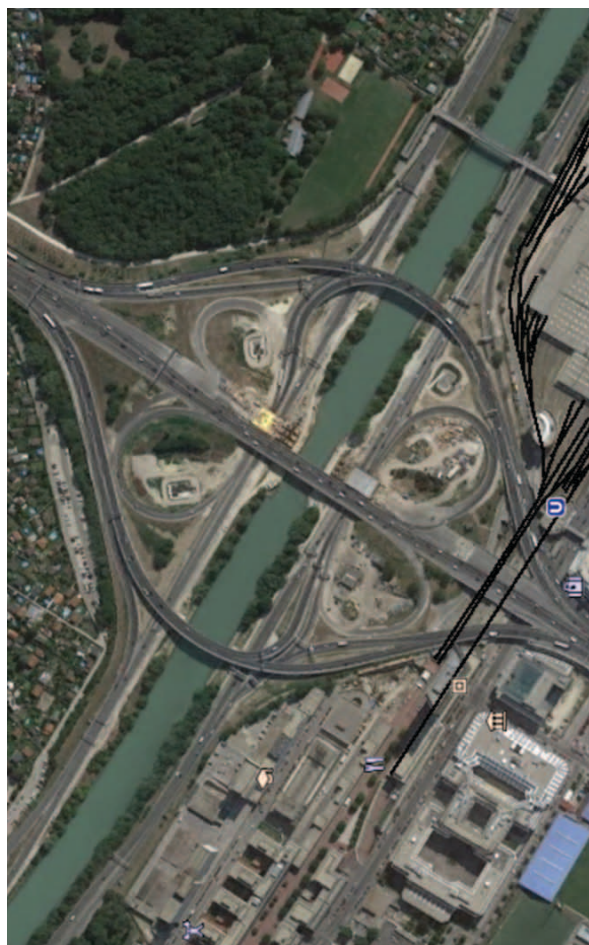
Similar efficiency improvements to capacity-constrained parts of the strategic network appear less problematic in most liveable cities. While Vancouver has enforced a moratorium on motorway improvements near its congested urban core (but has expanded the network elsewhere), other cities address bottlenecks. Vienna's Prater Interchange, for example, is currently undergoing a major renewal and capacity improvement to meet demand.



## Capacity is not sufficient to meet demand

FIGURE 32

### A4 and A23 Prater Motorway Interchange in Vienna



Current congestion performance demonstrates that the existing road network does not have the capacity to accommodate demand today. Modelling shows additions to the network and investments in public transport will not be sufficient to address the capacity constraint created by future population and density growth.

Little new motorway connectivity is planned in Auckland beyond 2017 except in the far north, despite growth of up to one million people. Capacity improvements are instead concentrated on expanding existing corridors. Even the \$5 billion Additional Waitemata Harbour Crossing only replicates an existing connection, providing lane capacity and resilience between the CBD and North Shore. New connectivity is limited to corridors including the East West Connection (which may still be delivered as a full grade-separated motorway) and Mill Road upgrade, which are currently planned to operate at grade, meaning greatly reduced capacity and slower journeys.

That a basic lack of capacity on not just the motorway but the road network, in general, is leading to congestion was a key finding from the initial round of ITP analysis<sup>51</sup> and can be seen in estimates of population and road length. In 2014, the last year for which unrevised numbers are available, road expansions totalled just 19km.<sup>52</sup> That is despite growth of some 30,000 people, around the population of Timaru, whose council manages 1700km of roads and 300km of footpath (an indicator of the urban road network). Much less capacity is being added to Auckland roads than is required to keep congestion constant, given vehicle kilometres travelled per person are holding steady.

<sup>51</sup> ITP 2012, p. 17.

<sup>52</sup> Auckland Transport, Annual Report 2014, p. 100.

# What is holding back public transport?

Public transport is expected to increase in both absolute and relative terms. However, the speed and extent of this increase over the next 30 years is not reflective of the amount of investment allocated.

Existing data indicates that while public transport will increase in attractiveness for trips to work, its role in providing general mobility is much less significant. Best available estimates are that public transport's share of all motorised travel needs will shift from around 9 to around 11 per cent by the 2040s. To achieve this improvement, public transport will absorb something in the order of a third of all transport spending in the region for a generation, and potentially as much as 40 per cent. This is not good value for money.

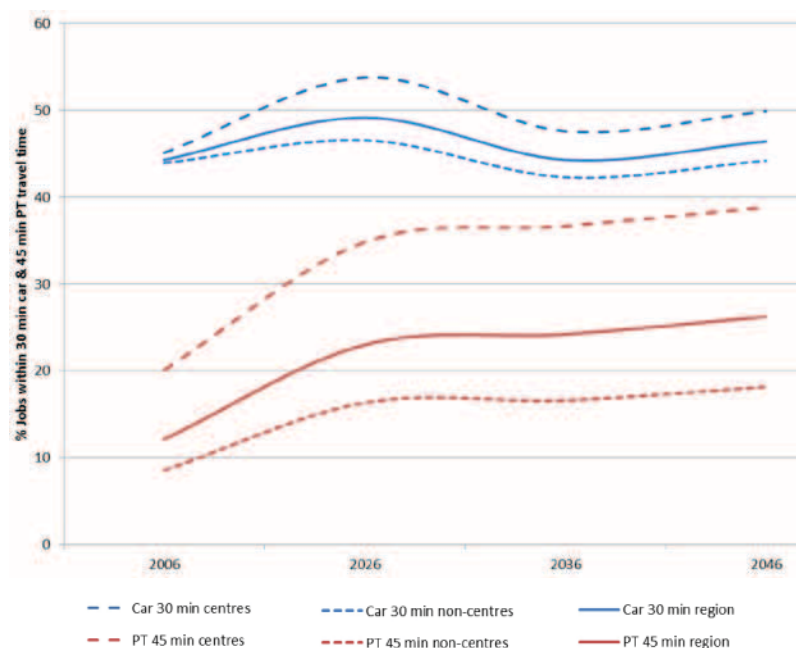
## Public transport is slow

Public transport will not substantially reduce reliance on private vehicles because public transport will remain slower than cars throughout the forecast period. Figure 33, reproduced below, shows that, even during the morning peak when public transport services are most frequent and congestion slows general traffic, cars will remain a faster mode of transport than public transport. This is true throughout the forecast period and both to centres and to more distributed employment locations.

Also significant is the fact that public transport accessibility is modelled on a 45 minute door-to-door commute. Cars, on the other hand, are modelled on a 30 minute door-to-door commute. The need to assume an additional 15 minute or 50 per cent travel time for public transport is understandable in light of the need for users to get to and from services, but there is no evidence that it meets user expectations. It is not clear that the majority of transport users consider an additional 15 minute or 50 per cent travel time to be a truly viable alternative.

FIGURE 33

### Access to employment by public transport and car<sup>53</sup>



<sup>53</sup> ITP 2012, p. 17.

## Public transport service levels will improve

That proposed public transport service improvements cannot provide a time competitive service to private vehicle suggests service level improvements are required. Faster and more regular services to a wider number of destinations will improve the time competitiveness of public transport and reduce the attractiveness of private vehicles.

Auckland Transport is in a constant process of investigating options to improve the speed, convenience and reliability of public transport. Park and ride is one notable area where authorities have identified a gap between service levels in Auckland and other comparable cities. Table 4 shows that Auckland's park-and-ride facilities lag by a very large margin the provision of such services in comparable cities.

TABLE 4: RAIL PARK-AND-RIDE PROVISION IN COMPARABLE CITIES<sup>54</sup>

City	Population	Rail Park-and-Ride Spaces	Number of stations	Stations with Park-and-Ride	% of total stations with Park-and-Ride	Park-and-Ride spaces per station
Wellington	487,700	5,201	49	38	77%	106
Calgary	1,265,100	13,170	36	19	52%	366
Auckland	1,486,000	2,202	41	18	44%	54
Portland	1,583,138	10,239	63	28	44%	151
Perth	1,740,000	16,658	68	48	70%	245
Brisbane	2,043,000	20,745	145	124	85%	143
Vancouver	2,419,700	5,853	55	9	16%	106
San Francisco	3,228,605	49,640	44	33	75%	1,128
Atlanta	3,499,840	24,000	38	23	60%	632
Melbourne	4,077,000	34,461	219	174	79%	157

Increasing park-and-ride facilities will help improve the attractiveness and speed of door-to-door commuting and should continue to be extensively investigated. While in many cases cost effective, they are, however, not cheap. A 2012 extension of the Albany park-and-ride added 550 car parks at a cost of \$5.5 million, or \$10,000 per carpark.<sup>55</sup> It is appropriate that this cost is at least partially met by users, but the appetite for paying for parking is still unclear. The roll out of the HOP card provides an opportunity to bundle parking and public transport and is appropriately also under consideration.

Nevertheless, park-and-ride service levels, as well as other lower cost options under development, including better user information and bus priority signals, will only influence overall user demand at the margin. Doubling park-and-ride capacity region-wide will only yield an additional 2,200 spaces, likely adding no more than 4,400 trips per day, or around 2 per cent to existing patronage. Much more comprehensive investment is required to lift public transport service levels to the point where transport users shift away from private vehicles, yielding benefits for congestion.

## Service levels are not the main constraint

Public transport service levels must expand significantly beyond planned improvements. This was a key finding of a 2014 strategic review by SGS on the Auckland Plan strategic framework<sup>56</sup> and is further supported by evidence that no significant level of service improvements are planned for public transport beyond 2025 (Figure 34) – the same time from which access to employment appears to stop proportionately growing – Figure 33.

However, the corollary of this conclusion is that an equivalent amount of new capital investment may be required every decade to that planned for the next decade if accessibility broadly commensurate with cars is to be achieved by 2045. Given that the 2006–2026 programme includes the CRL, dual tracking, electrification and new train units, AMETI busway, station upgrades and other major initiatives, such a programme would be extremely ambitious.

Although making provision for this much capital investment may, with concerted political effort and sacrifice, be achieved, other costs will drive the level of investment well beyond affordability thresholds. In Figure 34 renewals can be seen to rise noticeably over the term of the Auckland Plan as the need to depreciate the CRL and other projects emerges.

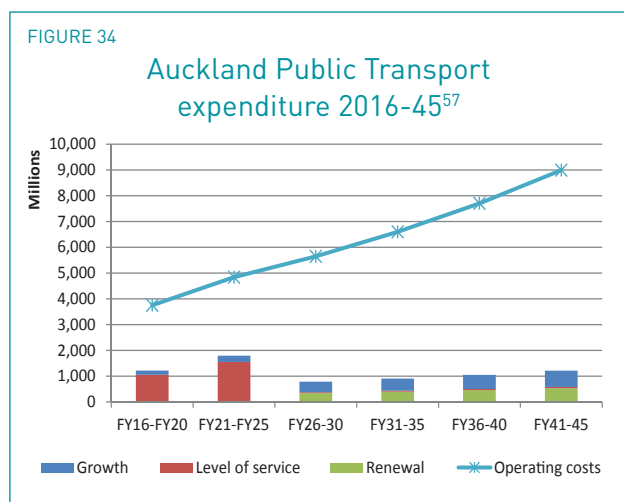
<sup>54</sup> Auckland Transport, Draft Parking Discussion Document, 2014.

<sup>55</sup> [http://www.nzherald.co.nz/nz/news/article.cfm?c\\_id=1&objectid=10778971](http://www.nzherald.co.nz/nz/news/article.cfm?c_id=1&objectid=10778971)

<sup>56</sup> SGS Planning and Economics, Review of Auckland Planning and Infrastructure, February 2014.

## Land use is the issue

Any additions to the capital programme will drive this contribution even higher and carry repercussions for operating expenses. Already, operating costs are by 2045 expected to approach \$2 billion per annum, suggesting a public subsidy of almost \$1 billion per annum from that point, or three times today's levels.



The levels of service required to lift public transport patronage by attracting users away from private vehicles are unaffordable and will deliver less value for money than extensions of the road network. The combination of low project benefit-cost ratios and underwhelming public transport patronage overall strongly suggests that priority investments are not delivering value for the region. Changes to the planned public transport investment programme may help rebalance the impact public transport has with the cost of service and should be thoroughly investigated.

However, the size of the gap between how much money is planned to be spent on Auckland public transport over the next 30 years and how much of the transport burden it is projected to shoulder is problematically large. Factors external to the public transport programme – the very demand for public transport itself – is evidently not present in sufficient quantities to support the proposed public transport programme.

Demand for transport is ultimately determined by land use. Rules, including whether land is zoned for residential, commercial or other uses, and various prescriptions such as maximum building heights and urban limits, shape transport demand. More dispersed land uses tend to require longer trips and can result in some types of activities, for example, more or different sports and recreation. Intensified land uses tend to result in shorter trips and can make different activities more accessible, for example, shopping and dining.

The distribution of land uses not only influences the amount and timing of travel, it also requires different transport solutions. All land uses require roads, but more intensified development can also sustain, and beyond a certain point must also be serviced by, public transport. Dispersed uses, such as suburban housing, typically cannot support anything more than minimum public transport services because the availability of road space and parking dramatically increases the speed, convenience and cost effectiveness of private vehicles.

Permitting intensified development in areas without adequate public transport exacerbates congestion by increasing the density of cars per kilometre of road space, without reducing demand for private vehicle trips. Preventing development in areas with good public transport will undermine the value of investment if access to services is constrained. To achieve good transport outcomes it is critical that excess demand for travel is not generated by land uses which are inconsistent with existing or planned future transport provision.

<sup>57</sup> Auckland Council, Long Term Plan 2015-2025.



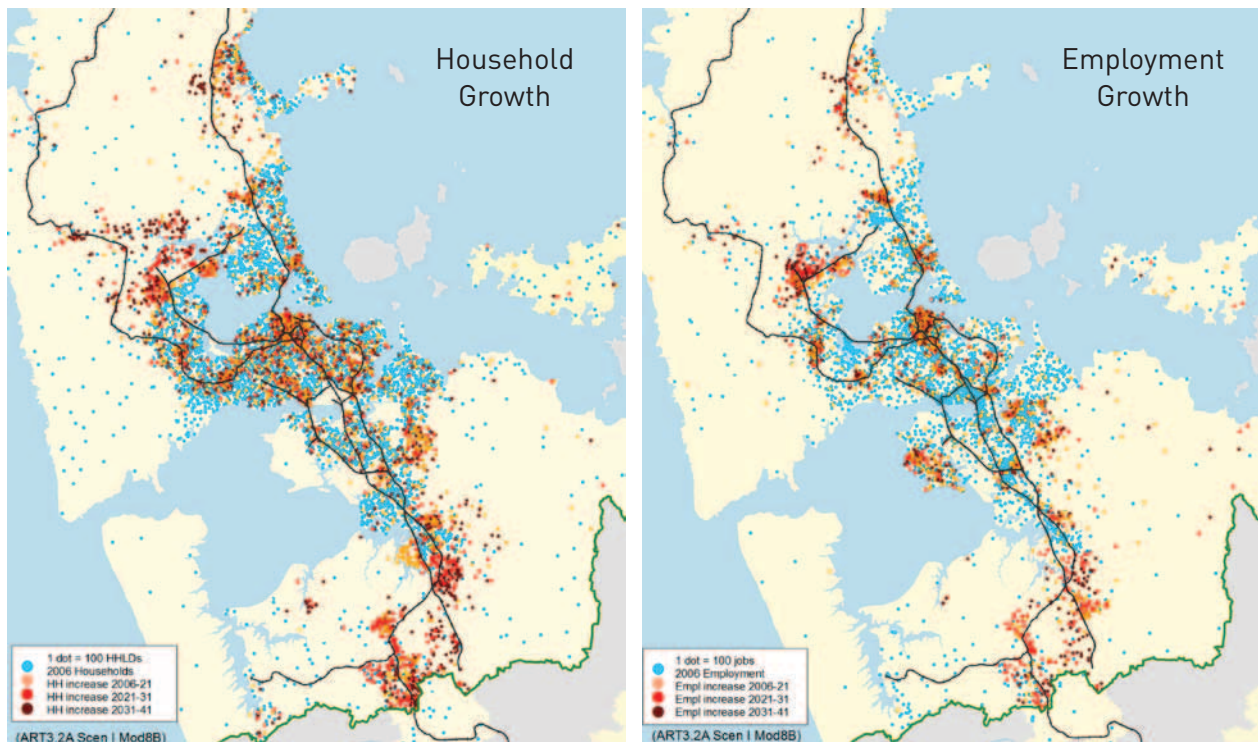
## Current land use does not support public transport

Auckland's existing urban form is not well suited to public transport. Despite comparatively high overall population density for a city of its size, the city lacks intensive development near the urban core and around rail stations and other high capacity services. Development has oriented around motorway corridors and coastal and other locations which leverage Auckland's renowned natural amenity.

Most importantly, generations of development have resulted in employment and housing patterns which are widely dispersed across the metropolitan area (highlighted in blue in Figure 35), increasing the need for flexible travel arrangements.

FIGURE 35

### Auckland Plan Growth Patterns



As the location of commercial activity has evolved in response to mobility and proximity to markets and services, so has the form and function of Auckland businesses. Auckland's economic composition is heavily weighted towards small, independent businesses with high mobility needs. Table 4 shows that over 40 per cent of all Auckland employees work in companies smaller than 20 people. These businesses, furthermore, comprise 96 per cent of all companies operating in the region.

## Planned land use does not support public transport

TABLE 5: AUCKLAND EMPLOYEE COUNT SIZE<sup>58</sup>

Employment Size Group	0	1 to 5	6 to 9	10 to 19	20 to 49	50 to 99	100+	Total
No. of Businesses	117374	32687	7958	6388	4024	1308	885	170624
% of Businesses	69%	19%	5%	4%	2%	1%	1%	100%
Cumulative % of Businesses	69%	88%	93%	96%	99%	99%	100%	
No. of Employees	117374	77040	57630	85100	120680	90210	238110	786144
% of Employees	15%	10%	7%	11%	15%	11%	30%	100%
Cumulative % of Employees	15%	25%	32%	43%	58%	70%	100%	

Employees have responded to Auckland's combination of land use and transport with the decision to work from home. Auckland has an unusually high number of residents who work from home relative to comparator cities (Figure 3 on page 10). Indeed, as many people work from home in Auckland as take public transport.

The product of historic land use and transport decisions is travel dependency heavily aligned to private vehicle use. Providing insight in to the size of the challenge, the Ministry of Transport estimates there are around 100,000 commercial vehicles in Auckland<sup>59</sup> and, on the day of the 2013 census, 65,000 Aucklanders drove a company light vehicle to work (11 per cent of all journeys to work and 19 per cent of all drivers).<sup>60</sup> Both these numbers largely ignore private vehicles used for work purposes and do not capture the disproportionate amount of travel undertaken by couriers, builders, sales representatives, customer service agents and other transport dependent professionals.

It is not known what proportion of this travel can reasonably be met by public transport, but it is likely very low and contributing to slow public transport uptake. Land use change over time will reshape travel demand, but the speed at which this occurs will be dependent upon a carefully conceived and sequenced land use plan.

The development of the Unitary Plan provides a once in a lifetime opportunity to completely revise land use in Auckland so that it aligns with the strategic objective of improving transport choice. Despite this unique opportunity, analysis of where the Unitary Plan allows and encourages growth comprehensively shows land use provisions will continue to undermine the speed and efficiency of public transport services.

Figure 36 shows Unitary Plan growth provisions on the Auckland isthmus and rail stations. Circle sizes indicate an approximate 10 minute walk to rail services. Development should, if Auckland's very significant sunk investment in rail is to be maximised, be permitted inside these circles as a means to improving the convenience and attractiveness of public transport.

In reality, significant land use change around the majority of stations on the isthmus – the area where demand for land is highest and where most growth under a compact model should in theory be accommodated – is not permitted under the Unitary Plan. The type of development activities which would benefit from access to rail, such as residential apartments and town houses, are only substantively permitted around 11 of the 24 stations on the isthmus (indicated in green). Development change is generally prohibited around 6 of the stations (indicated in red) and a further 7 permit some degree of change (indicated by orange circles).

<sup>58</sup> Statistics New Zealand.

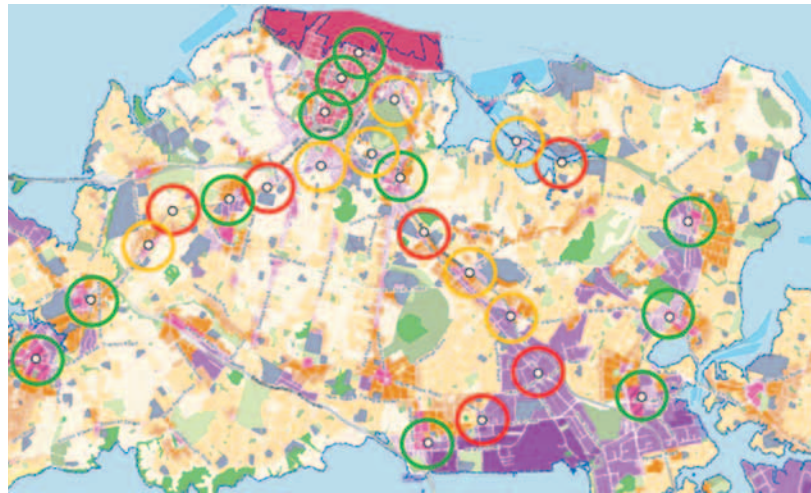
<sup>59</sup> <http://www.transport.govt.nz/ourwork/tmif/transport-volume/tv004/>

<sup>60</sup> Richard Paling Consulting, Journey to Work Patterns in the Auckland Region, 2014, p. 7.

Development restrictions around rail fundamentally undermine the value proposition of rail investment. The convenience and time competitiveness of public transport improves with proximity to trip origin and destination, suggesting restrictions around stations and enabling land use provisions elsewhere are a notable contributor to poor public transport uptake. Additionally, because rail has high fixed and low marginal costs, each lost passenger spreads fixed costs across a smaller number of users, increasing the dependency on public subsidies.

FIGURE 36

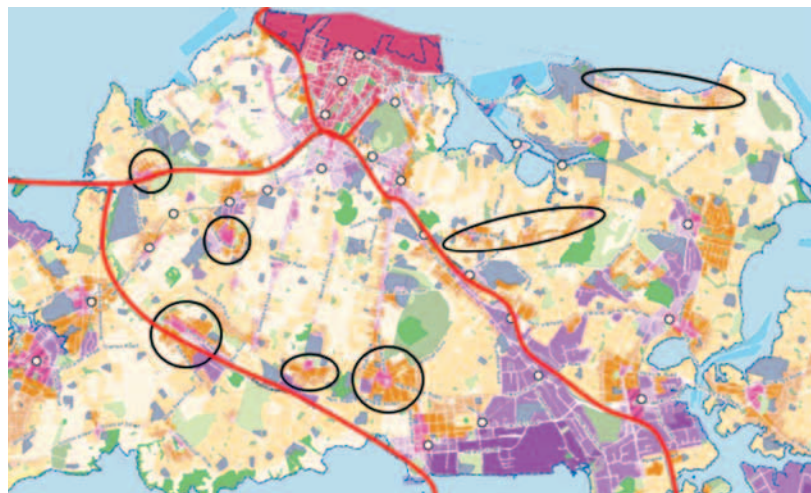
#### Unitary Plan growth provisions around rail



Restrictions around rail contrast with other parts of the isthmus. Figure 37 highlights areas where significant intensification is permitted, despite the absence of rapid public transport. New development in these zones (highlighted in black) increases dependency upon lower capacity public transport modes, specifically buses, which generally provide reduced levels of service. At the same time these areas tend to also have good accessibility to motorway investment, incentivising private vehicle use.

FIGURE 37

#### Growth enabled away from public transport





Not surprisingly, transport modelling conducted through the ITP and other processes has indicated unsustainable pressure on road networks including bus corridors. This has subsequently led to the emergence of light rail as a new transport solution to meet growth needs. However, as well as adding something in the vicinity of \$2 billion to the already significant \$10-15 billion transport funding deficit, light rail's post-Unitary Plan development reinforces and exacerbates sub-optimal land use-transport alignment. As indicated in Figure 38, land use change is not permitted over the great majority of corridors earmarked for light rail – a mode ideally suited to dense residential development.

FIGURE 38

### Light rail unsupported by land use change

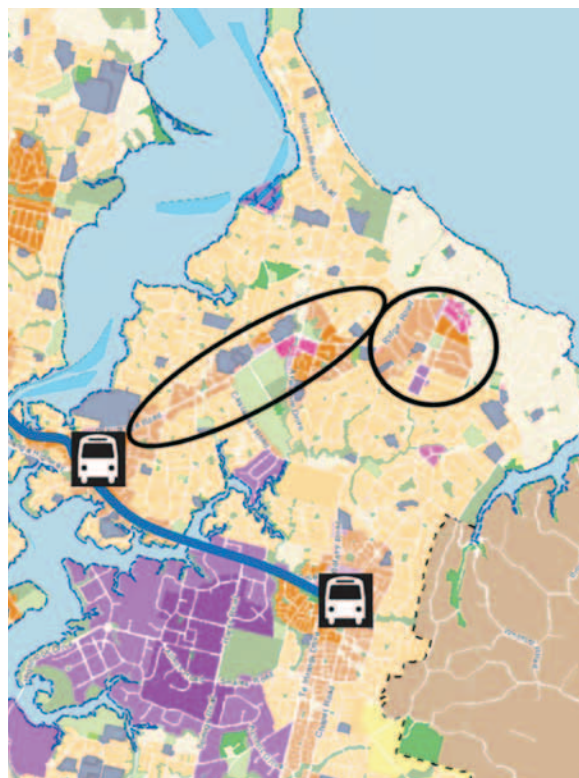


Similar issues can be observed in the east of Auckland. Rail does not serve the east, yet significant growth has occurred in the Pakuranga-Howick-Botany-Flat Bush area and much greater growth is planned. Consequently, the \$1.5 billion AMETI project has been conceived and is under phased delivery. However, as a busway, both its capacity and its attractiveness to transport users is lower than for rail solutions. Yet the level of growth permitted under the Unitary Plan compares to areas closer to the CBD with much more extensive rail, bus, walking, cycling and motorway access.

Somewhat surprisingly, heavy growth is permitted along the Pakuranga Highway corridor which is unserved by the busway. Highland Park town centre could see development of up to six storeys despite the fact that congestion into and out of the area is already an issue and no significant public transport improvements are planned.

FIGURE 39

### Growth in East Auckland disconnected from AMETI

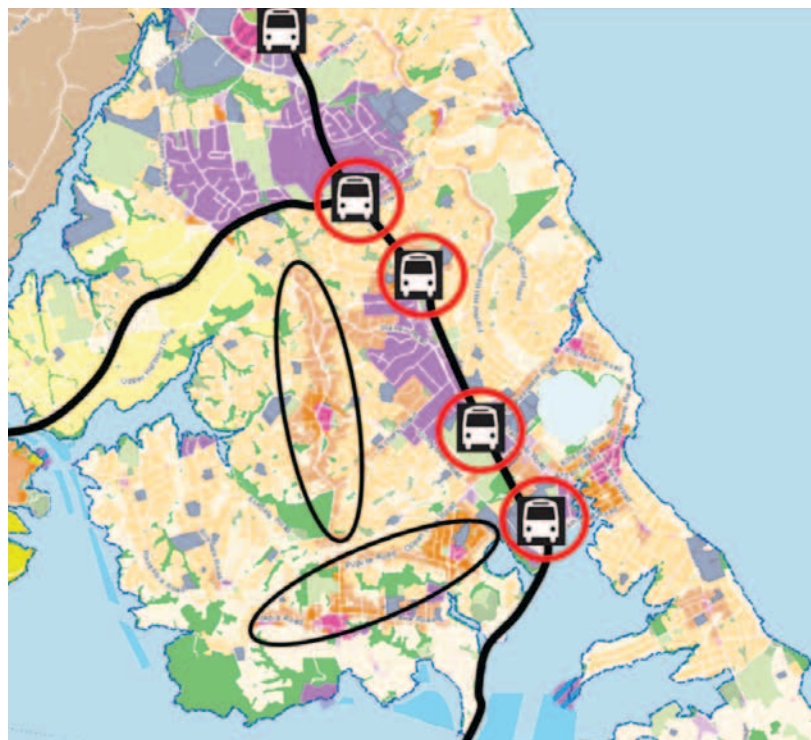


Comparatively high levels of intensification around bus stations in the east contrast starkly with very low levels of development change in the north. There, a high quality busway which has shown very strong patronage growth for almost a decade is almost completely unsupported by development opportunity. Of the five busway stations in operation, just one (Albany) permits any notable degree of development change. Development change is, however, permitted along the capacity constrained Glenfield Rd corridor and at Birkenhead and Northcote where no rapid transit is accessible.

Given the absence of solutions to capacity constraints in the CBD for northern buses, some land use restrictions around stations are almost certainly warranted, but the contrast with the east of Auckland is perplexing. In both situations there are opportunities for much better transport and land use integration than plans currently provide.

FIGURE 40

### Northern Auckland and the Northern busway



Land use-transport alignment in the south is more complex. Existing provisions in many centres are flexible. Hunters Corner, Mangere and Manurewa, for example, all have unlimited height restrictions. That development has not occurred in these areas indicates other factors, notably market attractiveness, are important. Nevertheless, that the Unitary Plan increases restrictions such as height in areas adjacent to rail, such as Manurewa, and does not provide flexibility around stations like Middlemore, Homai and Puhinui, is likely contributing to lower public transport patronage projections.



The presence of comparatively large amounts of industrial land in the south, specifically in Manukau, Takanini and Otahuhu, clearly affects residential density provision. At the same time, however, property holdings near rail stations in these areas (highlighted in green, below) tend to be larger, opening the possibility of ambitious urban redevelopment at scale. That developers are precluded from considering opportunities for visionary land redevelopment is unfortunate. If greenfield industrial land was made available to non-rail dependent industrial owners of these properties, much higher density development around existing investment within urban areas and close to amenity, including rapid transit, could be achieved without the loss of employment or industrial land.

The city has already seen one such opportunity substantially missed at Te Mahia. The 2013 sale of the Manukau Golf Club opened up the potential for major urban renewal close to existing rapid public transport at one end and waterfront access at the other. Scale redevelopment could have extended to low value industrial land around the station. Rezoning permissions and according land value improvement could have been tied to renewal of the train station and other public amenities, driving a truly integrated land use-transport solution.

<sup>61</sup> Auckland Council, <http://www.aucklandcouncil.govt.nz/en/ratesbuildingproperty/housingsupply/pages/specialhousingareas.aspx>

FIGURE 41

### Southern Auckland growth and public transport

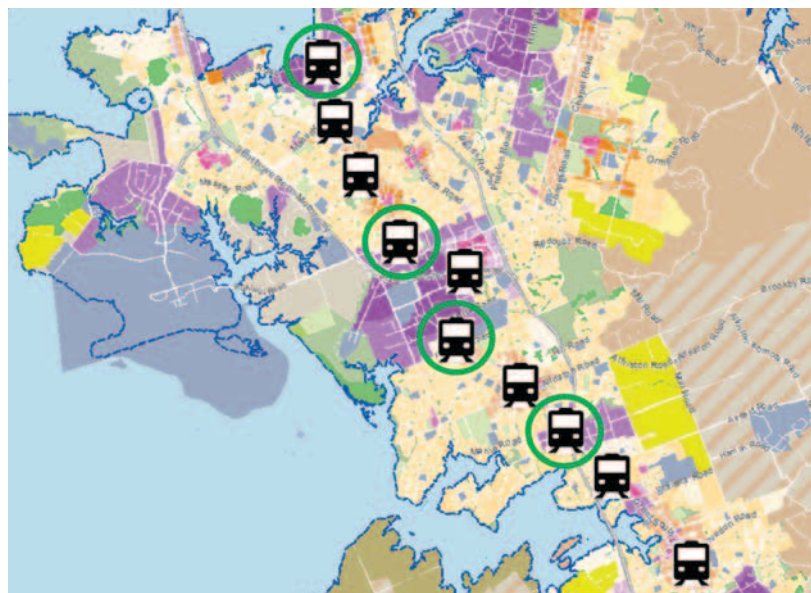


FIGURE 42

### The Te Mahia opportunity



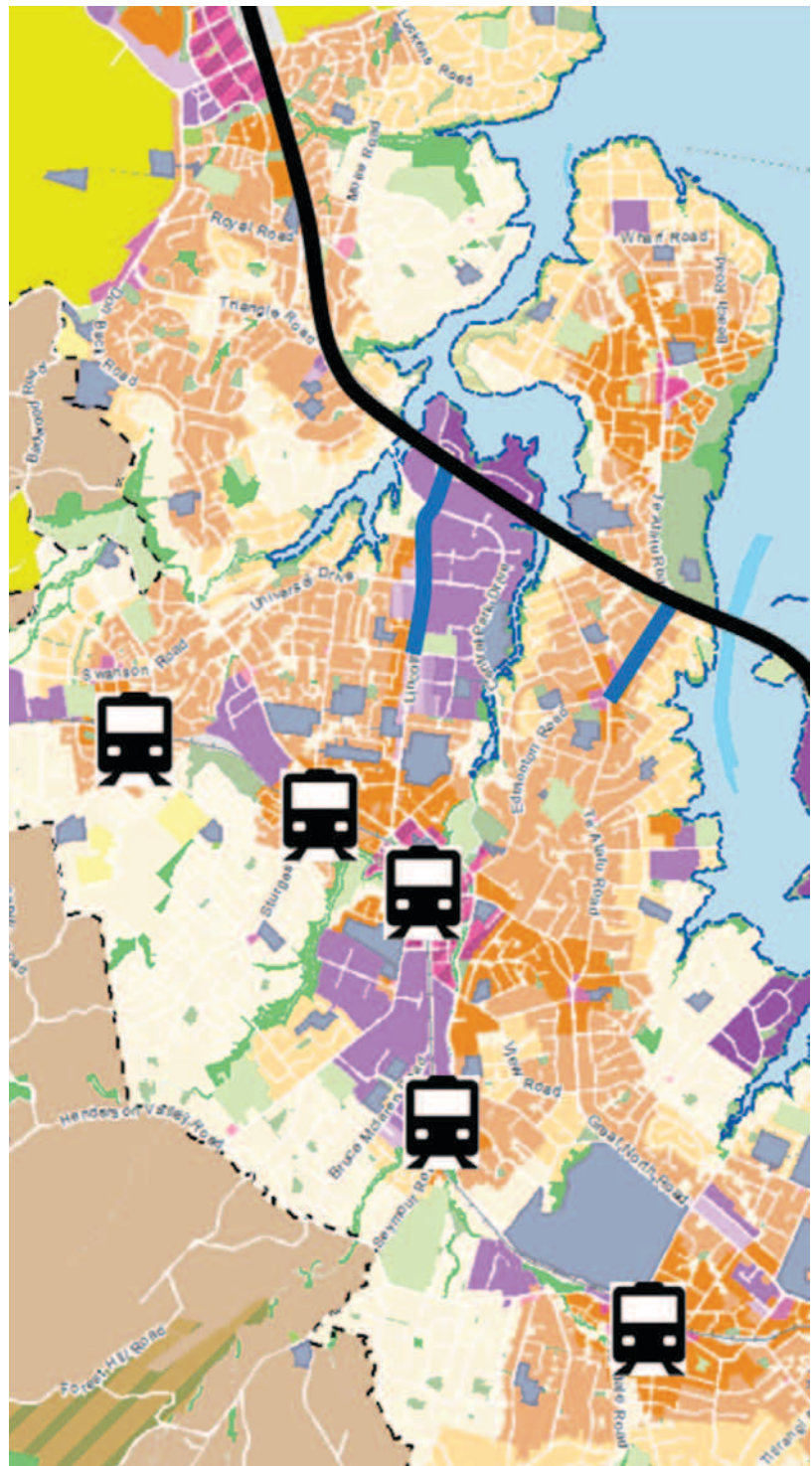
Instead, the 47 hectare site is consented for less than 500 homes, including a 5 hectare retirement village and there are no major plans to renew the station area to make it more attractive. The golf course site will yield an average of just 10 homes per hectare before roads and other amenities are included. In comparison, a similar sized block in Silverdale North has consent for 680 units and a slightly larger site in Huapai (65ha) has consent for 2000, despite neither having access to quality public transport.<sup>61</sup>

Only in the west is there wider policy consistency linking the region's large investment in public transport with development capacity in alignment with the compact city concept. Very significant amounts of growth are permitted around stations and, indeed, elsewhere across the west. Areas such as Te Atatu peninsula and Hobsonville, which are located away from rail, are also expected to see heavy growth. These, however, tend to have benefitted from the large increase in motorway capacity and have potential for reliable, efficient bus services.

In spite of generally more flexible land use provisions around public transport in the west, the overall growth provisions set out in the Unitary Plan are poorly aligned with the public priority of improving transport options. Development restrictions around the central city and rapid transit will decrease the number of homes and activities adjacent to quality public transport, reducing its competitiveness with private vehicles. Consequently, public transport growth will be limited and high fixed costs will be levied across a smaller user base, undermining the business case for further investment.

FIGURE 43

### West Auckland growth and major transport





## Better public transport-land use integration is critical, but not a panacea

However, even with dramatic improvements in land use and transport alignment, it should not be expected that public transport will become significantly more than a commuting (i.e. travel to and from work) substitute for the vast majority of trips across the Auckland area. Auckland's urban pattern has evolved for 70 years in response not to public transport or walking, but car travel. Destinations are spread out and varied, undermining high capacity public transport services. House types and suburbs are inconsistent with "the human scale", disincentivising walking.

The intertwining relationship between land use and transport means not only that land uses have evolved in response to transport, but iterative transport solutions have responded to land use. Public transport is not just under-developed, it is heavily focused on services to and from the central city. Even ideally located properties along the rail corridor tend only to have efficient public transport access to and from the CBD, Newmarket and several other key locations. Schools, parks, pools, shops, cinemas, beaches and other amenities which make living in Auckland attractive are overwhelmingly not competitively served by public transport.

Locations where car use is not required because public transport operates across a full 360° spectrum (i.e. public transport and walking can meet almost all travel demand needs, not only those along a bus or rail corridor) are very limited. Indeed, outside of the CBD and fringe it is not clear that any part of Auckland offers this level of accessibility.

Consequently, by far the majority of Auckland residents must own at least one private vehicle. Trips using this vehicle are therefore priced by users at the marginal cost, essentially the cost of fuel, not the average total cost of ownership, operation and maintenance. This makes private vehicles extremely cheap to run in comparison to public transport, where total costs are relevant.

The end result, exemplified in Stonefields, is that colocation of development with even very good rapid transit is no guarantee of good transport outcomes. Far more comprehensive actions are essential if Auckland is to address congestion via a shift to public transport, walking and cycling.

FIGURE 44

### Stonefields



## The Stonefields paradox

The importance of understanding user needs and demands is exemplified at Stonefields. The Stonefields development was conceived under the old governance structure as a new masterplanned residential, commercial and retail community in Auckland's desirable eastern suburbs. Oriented around a high-performing decile 10 primary school and proximate to extensive recreational facilities, Stonefields looks a paragon of integrated residential planning. Located just 8 km from the CBD and 1 km from two train stations, it is ideally placed to take advantage of rapid public transport. High levels of density have been encouraged, including apartments, and narrow streets calm traffic and limit car parking.

In spite of these advantages, Stonefields has today the highest car dependency on the isthmus. Some 83 per cent of all commuting trips are undertaken by private vehicle – a number only surpassed by Auckland's outer-lying suburbs. High levels of car use have led to rapid deterioration of road levels of service to and from the development, negatively impacting surrounding communities and bringing forward the need for an eastern corridor road solution.

TABLE 6: COMMUTING MODE SPLITS FOR SELECTED RESIDENTIAL LOCATIONS 2013<sup>62</sup>

Residential Location	Private Vehicle	Bus	Rail	Walk	Cycle	Other	Work at Home
Orewa	75%	5%	0%	6%	1%	2%	12%
Westlake/Takapuna	63%	12%	0%	12%	1%	2%	10%
Albany	77%	10%	0%	2%	1%	1%	8%
Henderson	77%	4%	3%	6%	1%	3%	6%
New Lynn	74%	7%	6%	4%	1%	3%	5%
Westgate	85%	3%	1%	3%	0%	4%	5%
Stonefields	83%	1%	4%	2%	1%	1%	8%
Newmarket	43%	14%	6%	25%	3%	4%	5%
Dannemora/Flat Bush	86%	3%	1%	1%	0%	2%	7%
Region	75%	6%	2%	5%	1%	3%	8%

There has not been an independent report published into why Stonefields has evolved in such contrast to public objectives. Anticipated bus services appear not to have been delivered alongside property development, leading to very low patronage, and urban design in adjacent areas has largely been left unchanged. Yet, even assuming a comparatively high 10 per cent of residents converted from car to bus, the result would still see over 8 out of 10 Stonefields residents who travel to work choosing to travel by private vehicle.

This raises the possibility that residents are not moving to Stonefields to live near public transport and avoid traffic, but are moving there to limit exposure to congestion by driving shorter distances. If this is the case, Auckland's compact city approach can be expected to increase congestion without significantly changing mode preference – a dynamic the modelling seems to support. Understanding of what residents want and for what purpose is urgently required.

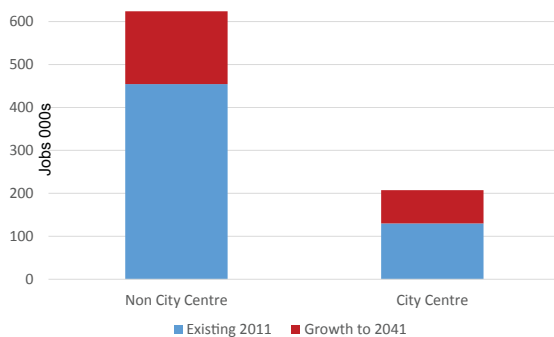
62 Richard Paling.

## Trips are becoming more, not less, dispersed

Reflecting the general disconnect across the Auckland Plan's land use and transport programme is evidence that trips will become more, not less, dispersed. Employment growth outside central Auckland will exceed by several orders of magnitude employment in the CBD and its surrounding area (Figure 45). Distributed locations are less likely, in general, to enjoy high quality public transport, undermining patronage growth.

FIGURE 45

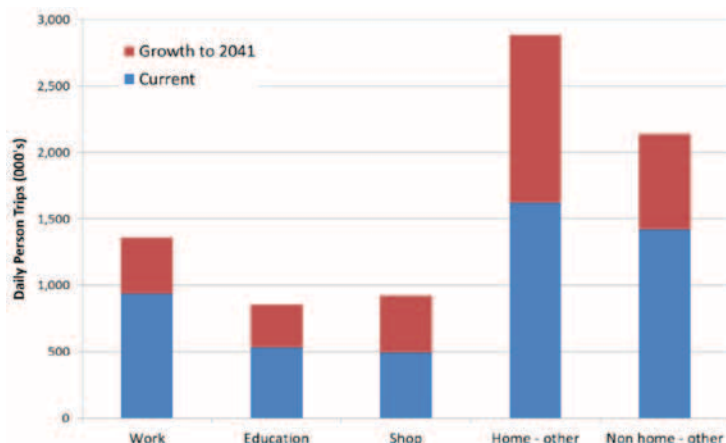
### Comparison of City and Non City Centre Employment Growth<sup>63</sup>



The timing of travel may also become more diverse. Activities other than employment, education and shopping will generate more travel need than the headline metrics combined. Since work, education and shopping tend to take place at times when public transport is more competitive, they also benefit from higher levels of service. The strong growth in 'other' journeys suggests future demand may be concentrated at times, as well as to locations, when public transport is less competitive.

FIGURE 46

### ITP 2012 projected increase in travel by purpose<sup>64</sup>



## Competing with cars will get harder

Speed may be the most demonstrable factor in understanding transport user decision making, but it is not the only one. Cost and convenience are also important. It is difficult to say whether cars or public transport provide superior value or convenience, but what can be said with some confidence is that cars will continue to become cheaper and more convenient. This trend will in some cases directly conflict with official aspirations for lifting public transport and will undermine value for money.

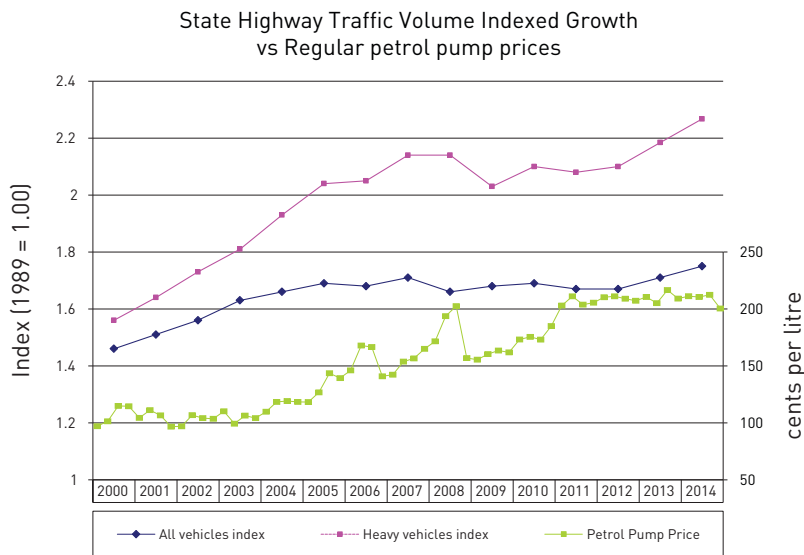
Figure 47 indicates that fuel cost rises through the 2000s closely mirror a flat-lining of average daily traffic. However, either side of the period roughly between 2004 and 2011, when pump prices are constant, state highway traffic increased at fairly constant levels. Recent dramatic falls in the price of fuel are only just beginning to show up in analysis. The results suggest vehicle kilometres per person could again rise, even in Auckland.

<sup>63</sup> NZCID from data provided by Auckland Transport.  
<sup>64</sup> Auckland Transport.



FIGURE 47

## New Zealand pump prices and annual average daily traffic<sup>65</sup>



Fuel is not the only factor likely to place upward pressure on demand for driving. Cars themselves are getting comparatively cheaper. Statistics New Zealand monitors new car prices as part of the Consumer Price Index. New cars increased 19 per cent between 2001-2011, well below general CPI of 32 per cent. On top of this, cars are improving in quality.

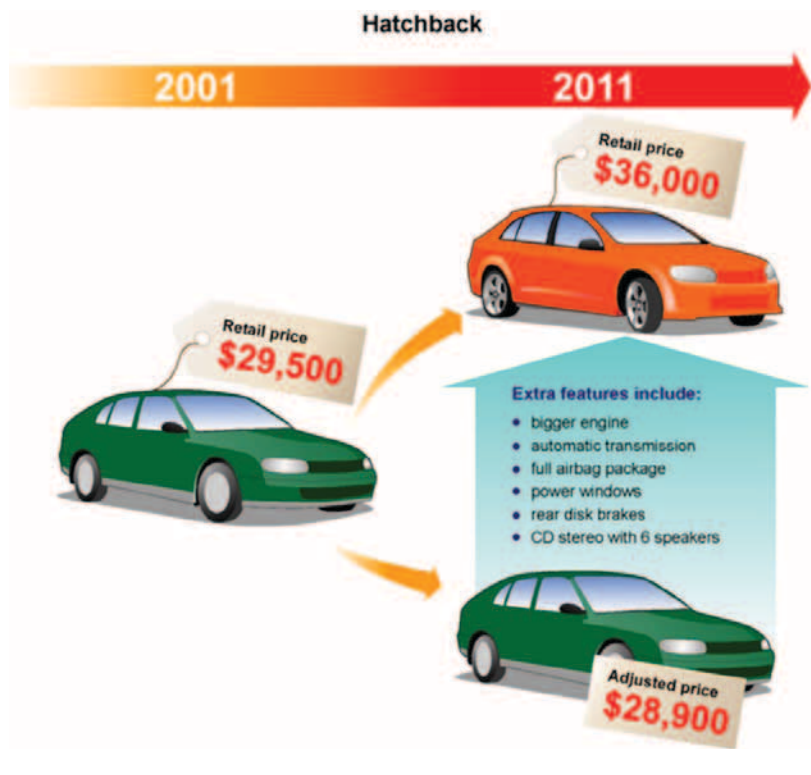
Adjusting for quality, Statistics New Zealand found new cars to be 1.5 per cent cheaper in 2011 than 2001. Cars are becoming safer, more fuel efficient, more comfortable and retain their status and recreational values all for less cost than has historically has been the case.

<sup>65</sup> Ministry of Transport and NZTA.

<sup>66</sup> Statistics NZ, [http://www.stats.govt.nz/browse\\_for\\_stats/economic\\_indicators/prices\\_indexes/new-car-prices.aspx](http://www.stats.govt.nz/browse_for_stats/economic_indicators/prices_indexes/new-car-prices.aspx)

FIGURE 48

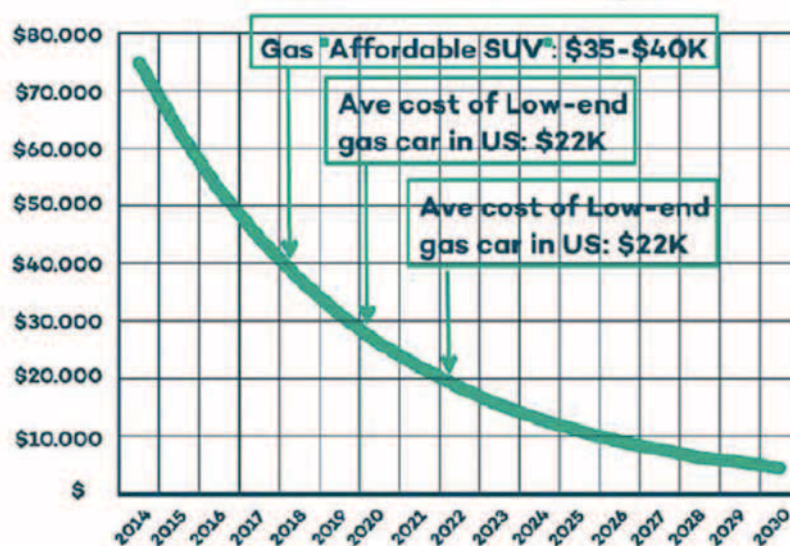
## New vehicles cost less<sup>66</sup>



These trends should be expected to continue and indeed will accelerate with the growth of electric vehicles. Battery prices for electric vehicles remain today the biggest impediment to electric vehicle uptake because their high cost push affordability beyond most households. Prices, however, are falling at around 15 per cent per annum. This has led one observer to predict that by 2022, electric vehicles will be cheaper to purchase than even low-end conventional engine automobiles (Figure 49).

FIGURE 49

Projected US cost of electric vehicles with 200 mile range<sup>67</sup>



Fuel, energy, purchase and other costs and benefits from owning private vehicles should be anticipated to constantly improve over time. The motor industry is market driven and is therefore heavily motivated to respond to customer needs in ways which publicly provided transport cannot. Even the introduction of autonomous vehicles should not be assumed to completely remove private ownership of cars because the industry itself will respond by appealing to status, privacy and individuality.

What each of these factors mean is that public transport has to work harder or become cheaper in order to attract patronage. Lower real costs of purchasing and owning a car means that average users are willing to tolerate higher levels of congestion, despite the negative impact their decisions have on wider economic activity, productivity and Auckland's competitiveness. Evidence is comprehensively showing that this trend will continue, greatly exceeding the capacity of the road network to cope.

<sup>67</sup> Tony Seba, from Smart Grid Forum, Draft EDGS Consultation, April 2015.

## Shifting to public transport requires much more radical change

In order for the congestion and transport options objectives of the region and New Zealand to be achieved, two options for land use-transport are possible for the city:

### i. Growth distributions remain the same, infrastructure and services change

Auckland's planned distribution of growth as set out in the notified Unitary Plan, where growth is permitted across large parts of the metropolitan area independent of transport connectivity, can be retained. However, because this approach to growth intensifies an urban form designed for cars, it will not see a substantial change in transport user decisions. Distances between services are too great and activities are too dispersed to support alternate modes.

An increase in the number and location of schools, centres, retail districts, community facilities and other amenities tied to investments in public transport, walking and cycling can address this. Services closer to residents will reduce the competitiveness of private vehicles for shorter trips, placing less pressure on arterial networks. This approach essentially retrofits Auckland's car-based urban form with a public transport-walking-cycling urban form.

Whether this approach is deliverable given public opposition to new localised development remains unclear. There is also risk that wider

agencies pivotal to the success of this approach, notably the Ministry of Education, are not aligned.

### ii. Growth distributions change, most infrastructure across city remains the same, new infrastructure concentrated in dense new public transport-oriented centres

An alternative is to revisit the growth assumptions of the Auckland and Unitary plans to align with infrastructure and services. Under this approach, development would be disincentivised in areas separate from public transport and concentrated in areas with services which lead to a transformation in city development.

There is a large, untapped opportunity to greatly increase growth in the CBD and fringe where current and future transport investment is concentrated. Auckland Plan projections for less than 20,000 more dwellings are inconsistent with the scale of investment in the area. The CRL, Additional Waitemata Harbour Crossing, City Centre Integration Project, Wynyard development and other projects are crowding out investment across other parts of the region but providing for little in the way of growth. Given this high proportion of investment and inherent amenity, the area from Ponsonby to Mt Eden, Newmarket and Parnell should be accommodating orders of magnitude more growth.

Outside the central area, few opportunities inside Auckland's existing metropolitan area offer the scale necessary to generate the type of land use-transport transformation envisioned in the Auckland Plan. One such location is Tamaki. Assuming basic road connections to and from the area can be delivered to support growth in the area, the Tamaki opportunity does provide the kind of scale and transformational potential needed to create a public transport and walking oriented community. It is, however, something of an anomaly. Over half the housing stock is publicly owned, on large sites and in need of replacement.

The major opportunities for transformational urban development aligned with the Auckland Plan vision are therefore outside the existing metropolitan area. Where new development can be supported by quality public transport and other amenities and masterplanned to accommodate growth, high density urban development can reduce overall land demands in support of the compact vision.

Brisbane, for example, which is dealing with much more challenging growth than Auckland, is concentrating some of its demand in new greenfield centres close to rapid transit. Springfield is a new, masterplanned high density development around rail and motorway connections some 25km and a 30 minute drive south-west of the Brisbane CBD.

What makes Springfield an exemplar relevant to Auckland is that the development is comparatively land efficient, consistent with a compact city. Over 100,000 people and 30,000 jobs will be provided on less than 3000 hectares. Although development is greenfield, it has been planned from the outset with a mix of high density transit oriented urban development and single level housing close to public transport. There is no need to retrofit car-based urban form with different land uses or incompatible transport networks. Thus, even though agricultural land was appropriated for development, the intensity of growth ultimately means less expansion than is envisioned for Auckland.

A Springfield approach for Auckland could see a city of up to 100,000 residents masterplanned around one or two new greenfield rail stations in Auckland's south adjacent to State Highway 1. Height limits could be unrestricted, allowing maximum flexibility for developers. Amenities including schools, shops and community facilities could be designed into the development so as to minimise transport and other infrastructure costs, maximise use of rail and, most importantly, provide new housing. For Aucklanders wanting a different lifestyle than suburban housing, scale development of this type could yield massive building efficiencies, finally delivering units in an affordable \$300,000-\$400,000 price range.

FIGURE 50

### Springfield<sup>68</sup>



<sup>68</sup> Source: <http://www.greaterspringfield.com.au/>

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# Improving Auckland's Transport Future

Auckland can and must address congestion in a way which is meaningful for residents and businesses. There is a strong desire among Aucklanders that public transport carries a greater share of the overall transport load, thereby providing alternatives to private vehicles and freeing up road capacity for freight, commercial and essential traffic.

Progress towards addressing congestion and public transport priorities is expected to remain limited. Several factors are responsible. Public transport uptake will be stymied by land use restrictions which reduce the speed and attractiveness of public transport. Congestion will be aggravated by a lack of capacity in the network and a general absence of major land use initiatives to substantially alter the competitive advantages of private vehicles. Market dynamics which enhance the attractiveness of car ownership and use will exacerbate pressures.

Market developments remain largely beyond the reach of public authorities. There are thus two major barriers to achieving the twin transport priorities for the region which can be targeted by policy:

- Land use provisions which exacerbate transport pressures
- Lack of capacity on the road network to meet demand

To satisfactorily address these two top issues in accordance with public expectation and political aspiration, the New Zealand Council for Infrastructure Development considers the following actions are now required:

## 1. Revise and integrate land use and transport planning and investment

For a transport system which enables the region to meet growth and realise its economic and social potential, the decision making methodology behind growth management must be reviewed. The process for deciding where and when growth can and should be accommodated across Auckland needs transformation. Infrastructure services, particularly transport, but also water, energy, education and community facilities, must be prioritised when decisions about growth are made. Under existing plans these most basic and essential of services have been subordinate to other factors with little or no empirical basis.

As a direct consequence, costs are rising, services cannot meet demand and growth has nowhere to go.

An infrastructure-led solution to urban planning would follow a different path:

### a) Understand what residents and transport users want to trade off

Real understanding is urgently required of what trade-offs the public in Auckland are prepared to make in order to achieve priority objectives. It can be shown that congestion relief and public transport options are the top priorities, but there is no agreement over what success looks like. What is congestion – is it a trip which takes a bit longer or a lot longer and does tolerance change at different times? Do residents want public transport for themselves or other transport users and for what trips?

Current council direction is largely to trade off congestion relief where alternatives can be provided for – does this meet public need? Congestion relief and public transport can be delivered, but what is the price that residents and businesses are prepared to pay? Recent findings on road pricing suggest they may be willing to pay more than expected.



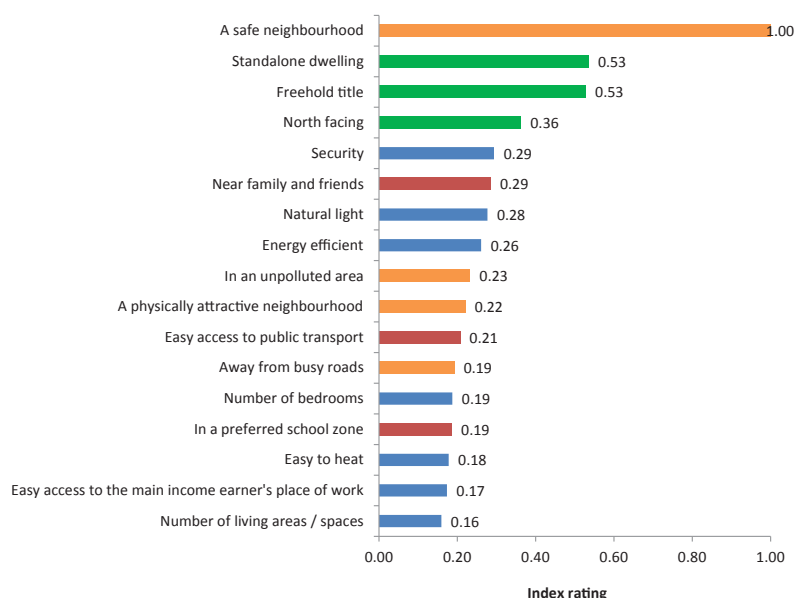
Perhaps even more importantly, this discussion needs to expand to land uses. A campaign is required to educate residents on the relationship between land use and transport. At a conceptual level, residents cannot have detached homes, good public transport and low rates. Something must be traded off. What is it that residents want to prioritise? It is known that they want public transport, but do they want to live in different house types consistent with public transport provision and – critically – are they prepared for those house types in their neighbourhood?

Evidence says perhaps not. A recent survey for the Auckland Council indicated proximity to public transport rates well below other desirable housing characteristics like freehold standalone dwellings. The report also found that affordability played a significant role in tempering these preferences, but this infers policy should be shifted away from initiatives like land constraint which make general public preferences more expensive in an effort to promote other, predominantly council, objectives.

Engaging with residents and businesses on their expectations and needs and delivering on those needs is essential because, as witnessed at Stonefields, these same parties will ultimately act in ways which suit their lifestyle. If policy is not consistent with this lifestyle and in tune with evolving market trends, major policy objectives such as addressing congestion and increasing public transport use cannot be achieved.

FIGURE 51

### Top 15 rated features of homes<sup>69</sup>



### Metropolitan limits transfer costs, not reduce them

Metropolitan limits are planning restrictions which constrain the release of greenfield land for urban development. One of the key reasons used to support boundaries is that it is cheaper to contain development and avoid the costs of expansion. However, while it is true that infrastructure investment can be deferred or avoided, thereby reducing near term capital costs for infrastructure providers, there are no cost savings to society as a whole. This is because urban limits transfer the ability to develop land from those who provide infrastructure to those who receive zoning permission. The value uplift of land then ceases to be a function of whether costly services have been provided and instead reflects planning approval. Land with planning approval increases in value, reflecting its scarcity, and infrastructure costs which previously were capitalised into the value of land become additional. Windfall benefits are accrued to owners of developable land, infrastructure providers defer spending, but costs added to new houses offset any savings at the societal level. Where higher land costs lead to land banking and reductions in the supply of housing the impact of urban limits is a net cost on society which exceeds infrastructure savings.

<sup>69</sup> Market Economics, *The Housing We'd Choose*, 2015.

## b) Identify the actual costs and benefits of infrastructure and development by place

The needs, capacities and costs of infrastructure must be understood at the level at which these effects are felt. At the same time, the costs and opportunities of development on public services must also be known.

There is a real and genuine cost placed on local communities and businesses when development occurs in areas where infrastructure services are insufficient to meet growth; congestion can worsen, flash flooding may arise and schools may become crowded. Understanding whether such costs are present or whether services have capacity to accommodate growth is an essential activity of asset management. Communicating this knowledge is an essential activity of democratic decision making.

Spatial planning which identifies and recognises the place-based impacts of infrastructure and the local effects of urban development can address this problem. Detailed knowledge of infrastructure capacity at the sub-regional level can be used to inform and engage with local residents and businesses. Empirical information which demonstrates that existing services will not be compromised by growth, or will in other ways be compensated for, can help reduce local opposition to growth.

This work is already underway. The Housing Project Office inside the Council has, at a strategic level, already aggregated infrastructure service data for the region and mapped information by time period. This illustratively shows which services have capacity in which parts of Auckland today, and when current investment plans will provide for new growth. Bringing this information down to the level of impact where it is felt and understood by communities and other local interest groups is within reach.

## c) Sequence growth spatially to align with infrastructure service capacity

Infrastructure and development needs and opportunities at a neighbourhood level, once known, will reveal locations where growth can occur today and where it cannot. It will also reveal where more growth can be permitted with nearer term infrastructure investment and where essential services cannot affordably be provided until the longer term. Sequencing growth to ensure services are in place when development occurs is the ultimate objective of urban planning.

The Unitary Plan does not sequence growth. With the exception of greenfield 'RUB' development, thirty years of capacity is released on day one, regardless of what infrastructure and amenity is in place. Development which tries to occur in areas where growth is planned, but where water services are inadequate will – and must – be stopped by Watercare, undermining regional growth capacity and the investment decisions of property developers. Other infrastructure providers, notably transport, , have less scope to prevent development and it will occur regardless of what services are in place.

A comprehensively planned and implemented infrastructure-led approach to city growth and development would phase growth so that it occurred in areas with existing infrastructure capacity first and planned capacity after. This would have the effect of reducing costs on ratepayers, improving property investor confidence and enabling engagement with local communities with empirical information.

## d) Go in “guns blazing”

After the timing of immediate priority spatial developments has been agreed with communities of interest and aligned with infrastructure providers, the Auckland Council must lend its full weight and commitment to integrated urban development. Led by Panuku Development Auckland, priority locations must be rapidly

## Value capture

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served with water, parks, schools, facilities and roads and public transport to meet planned growth demand.

Speed and concentration of service provision is critical for two reasons. First, property investors cannot commit to projects where there is uncertainty around the timing and standard of services. Quality schools, recreational facilities and transport services attract residents and businesses, lowering the risk for developers. Authorities can influence market behaviour with quality services, but these must be in place early - the market does not yet have confidence future public service provision will be delivered on time and to standard.

Second, the shorter the timeframe between delivery of services and the development of residential and commercial property, the lower the cost to service providers. New development cannot proceed without basic water, roads, electricity and telecommunications services, but a quality city cannot be developed without public transport. In order to orient not just development but habits around public transport, rapid transit must anticipate - not lag - urban development. It is too late to deliver public transport after habits have been formed and it is costly to provide services for which there is no demand.

A key advantage of redevelopment at scale around a defined location is the ability to use land value improvement to pay for infrastructure. When councils rezone areas for higher density or wider activities, there is an immediate land value increase afforded to affected property owners. The gains from rezoning greenfield or industrial land can be extremely significant. Given the need for infrastructure services to meet growth potential, it is appropriate that some of this land value is captured by infrastructure providers.

The most obvious mechanism to capture land value improvement is through a capital gains tax. Implementation of this tax can be difficult, however, because tax is often not realisable until the point of sale. A temporary targeted rate, on the other hand, can under existing law be placed on a development area rezoned for growth. A thirty year targeted rate applied to an area like Tamaki or a Springfield equivalent can be used to raise debt to pay for enabling infrastructure.

An integrated growth solution for Auckland such as a new urban centre oriented around rail, could be substantially funded by private investment leveraged from the land value improvement of rezoning greenfield land. This would lower costs to existing residents, add amenity for new residents and provide a genuine response to Auckland's growth challenge.

## 2. Enhance capacity in the road network

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Aligning land use provisions with current and future transport investment will go some way to alleviating pressure on Auckland's congested road network. Integrated policy cannot, however, undo 70 years of investment and development, nor can it completely remove the need for road travel. Capacity in the road network is the only means to stop congestion expanding further into the interpeak, impeding commercial movement, and emerging through weekends and the off-peak, undermining liveability, social opportunity and the attractiveness of Auckland as a destination for labour and investment.

Technologies available today mean capacity can be provided in different ways. Signalling improvements to major arterials can synchronise traffic light phases to maximise throughput. Car park sensors can tell potential customers where spaces are available, avoiding the need for "circling". Online services can direct traffic to the most efficient route. These options often deliver benefits orders of magnitude higher than their cost and must become a priority focus of transport authorities.

Notwithstanding the rich opportunity to defer some capital improvements with technology, the weight of Auckland's growth on top of an already congested system will require capacity. Although capacity can be delivered

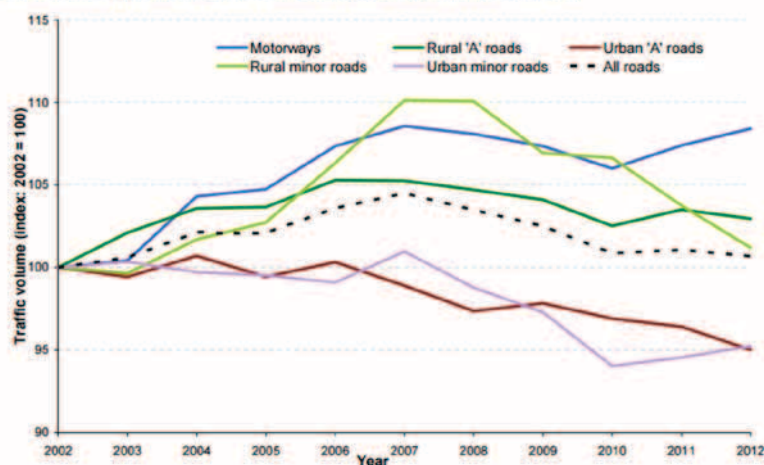
in the form of a large number of arterial upgrades, the fastest, most productive and efficient means to deliver new capacity is through additions to the regional strategic network. Separated at the grade, Auckland's motorway network can be enhanced with fewer implications for communities and transport systems, but can still deliver regional transport benefits. Motorway improvements draw traffic off local roads, shape urban form and can be managed and priced to achieve optimal transport network efficiency.

Motorway capacity is essential because motorways generate economic activity. The efficiency of grade separated high speed travel shapes and enables business investment and opportunity in ways which local roads do not. Figure 52 from the UK shows that motorway use has increased in recent years in spite of flat demand for road use. This is because businesses reorient around motorway connectivity to take advantage of efficiencies. This places a constant upward pressure for capacity which delivers economic uplift. The only period of decline for UK motorway demand has been through the Global Financial Crisis, underlining the point that demand is both resilient to factors such as population aging and supports the economy.

FIGURE 52

Motorway demand increases even when traffic demand is flat<sup>70</sup>

Road traffic by road class in Great Britain, from 2002 (Table TRA0102)



Additions to the motorway network can be in the form of new lanes to existing corridors or new connections to unserved locations. New connections provide the opportunity for land release, redevelopment and provide resilience in the system. Shorter and more direct trips deliver employment, productivity and cost advantages for businesses and residents.

There are a range of potential options for new connections in Auckland. Grade separation and linkage of the Mill Rd corridor to the state highway network would release new capacity in Auckland's biggest growth areas, but its impact outside these areas would be limited and the opportunities for agglomerative and other competitive efficiencies is unclear. Similar initiatives in the north or west are subject to the same issues.

One corridor, present on motorway strategic planning documents for half a century and protected for potential future use as a transport corridor, provides a different opportunity. The Eastern Corridor is a partially designated land and water channel connecting the Auckland CBD with Orakei, Meadowbank, Glen Innes and Panmure. Connecting this corridor to the proposed Additional Waitemata harbour Crossing to the east of the CBD at Grafton, would create an entirely new high capacity road corridor between Auckland's south, east and north, delivering region-wide benefits equivalent to those soon to be realised with completion of the western ring route:

- The system-wide ripple effects of constrained capacity through Spaghetti Junction would be permanently alleviated.

<sup>70</sup> UK Department for Transport, Road Traffic Statistics, June 2013.

FIGURE 53

## The Eastern Corridor



- Freight and commercial traffic would have an alternate route to the port, central city and beyond.
- Two of the region's biggest business and employment hubs at East Tamaki and Penrose could have new direct connections to labour and the CBD.
- Growth and opportunity centres in Glen Innes, Panmure and further east would have road access to supplement rail and meet very high growth aspirations.
- Resilience in the system will be greatly improved.

A unique advantage of the Eastern Corridor transport solution is the ability to leverage the potential of the largest ever infrastructure project in New Zealand: a \$5 billion Waitemata Harbour tunnel. The proposed Additional Waitemata Harbour Crossing is throttled at both its northern and southern termination points, constraining its potential. It cannot connect new businesses and communities and it cannot lift the opportunities for the region, as its predecessor, the Auckland Harbour Bridge has done. Consequently, it cannot deliver economic and social benefits consistent with its high cost and these limitations are highlighted by conventional cost benefit analysis which shows a return of 40 cents for every dollar invested.

An Additional Waitemata Harbour Tunnel landing to the east of the CBD may be able to do better. Connecting with State Highway 16 south of the Port of Auckland and continuing underground to protect environmentally sensitive estuary habitats around the Orakei Basin, an Additional Waitemata Harbour Tunnel can become the new lynchpin for an entire network linking Northland and Waikato, Albany and Penrose, Glen Innes and the CBD.

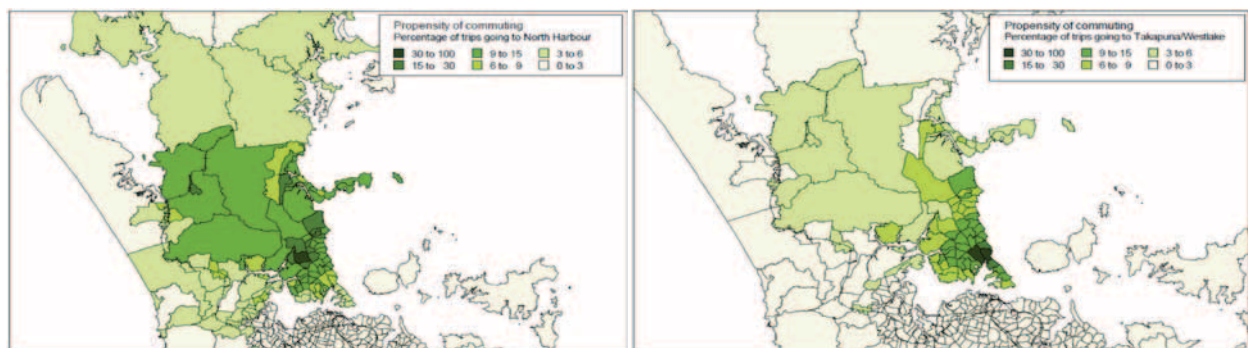


These connections are heavily impeded by existing capacity constraints across the Waitemata harbour. Static traffic volumes for a decade across the Harbour Bridge indicate capacity is now more or less saturated. The consequence of capacity constraint can be seen in economic relationships across the harbour. Figure 54

shows that employment on the North Shore is met almost exclusively by North Shore-based residents. A barrier clearly demarcates where employees can and cannot be sourced for jobs on the North Shore and that barrier is the Waitemata Harbour.

FIGURE 54

### Employees in Albany and Takapuna by source location<sup>71</sup>

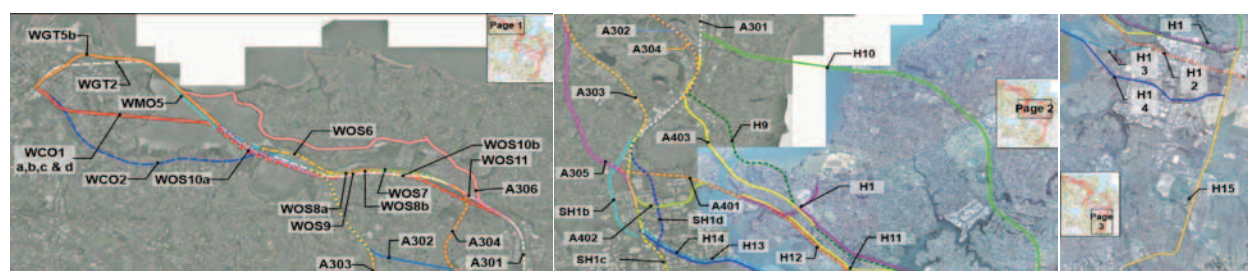


North Shore businesses are evidently limited in their access to labour. Smaller labour pools mean it is harder to obtain the right staff, reducing productivity and competitiveness. It is likely that employment in the CBD is also constrained for northern residents, but that strong historical trends conceal the extent of the impact. Releasing constraints across the harbour will improve the labour productivity of North Shore businesses and cement better connections with suppliers and markets further south.

A 2004 investigation into a potential Eastern Corridor found economic benefits of \$1 billion - \$1.5 billion per annum – at the time equivalent to a full percentage of GDP. The cost of the corridor (excluding harbour crossing) was estimated at up to \$3 billion, yielding a potentially massive return on investment for the national economy.<sup>72</sup>

FIGURE 55

### Eastern Corridor options evaluated in 2004



<sup>71</sup> Richard Paling.

<sup>72</sup> BERL, Investing for Growth: Economic and Strategic Importance of the Eastern Transport Corridor, 2004.

That proposal was dropped on environmental and community objections to an above ground motorway through sensitive land. The post-2020 need for an Additional Waitemata Harbour tunnel provides the opportunity to revisit the Eastern Corridor as an extended tunnel solution which not only protects, but restores the environment. Delivery of a new subterranean transport solution through the Orakei estuary area can be tied to environmental restoration, including the reconstruction of lost habitats and ensuring the permanent protection and sustainability of one of central Auckland's few remaining undeveloped parks and waterways.

Further east, an Eastern Corridor solution can be tied back into State Highway 1 around Mt Wellington, finally addressing the most significant bottleneck in the New Zealand transport system. Alternately, or in addition, the corridor can be extended into East Tamaki to meet the original concept plan of a motorway corridor down Te Irirangi Dr to join with State Highway 1 at Manukau, where it could connect to the Mill Rd corridor.

Te Irirangi is an existing transport corridor ideally suited to expressway development, with options for grade separation into the future. Land uses along the road are overwhelmingly industrial and low density residential developed in the past three decades. Light rail has been proposed for the unused inner median of Te Irirangi Dr, but the absence of densification

opportunities means it is not a viable option.

An eastern corridor which extends to Te Irirangi can be combined with AMETI to include a busway. AMETI delivers marginal benefit overall with limited strategic potential. An Eastern Corridor with busway could be partially funded from AMETI's billion dollar plus budget and used to meet both public transport and road capacity needs.

By delivering additional road capacity in general and providing an alternate route around the CBD in particular, the Eastern Corridor solution will provide the capacity necessary to prevent congestion spreading into the interpeak. Capacity will be released along the length of State Highway 1, with immediate impacts for flows along SH 20 and along key arterials including Great South Rd.

The shift of traffic off arterials in growth areas around Stonefields, Glenn Innes, Panmure, Sylvia Park and further east will enable vast urban redevelopment. Formally busy corridors will have the potential to be transformed into higher density, liveable, walkable environments with retail and other amenities designed to meet growth. Communities will be stronger, businesses will be better connected and congestion will be substantially reduced across the region.

Eastern Corridor options linked to an eastern-aligned harbour tunnel are appropriately being modelled through the Auckland Transport Alignment Project. Future projections of congestion across the road network justify analysis of solutions which have long been part of the transport plan for the region. Existing experience from the Western Ring Route proves that new connectivity, providing alternate connections across Auckland have major sustained benefits for productivity and competitiveness.

### 3. Implement road pricing

A road network plan, public transport system and land use vision for Auckland which addresses congestion and delivers transport options will require new funding. Both fuel tax and general rates can and should continue to play a role in funding transport, and value capture should be investigated wherever possible, particularly as a means to fund rapid transit. The most efficient means to generate revenue for road investment, however, is through road pricing.

Road pricing is the direct charging of cars, trucks and other vehicles for accessing the road network. It can take any number of forms, from conventional tolls to electronic tag monitoring and even, in the future, comprehensive vehicle tracking and charging by satellite or mobile technology.

The advantage of road pricing over other funding mechanisms is that it strengthens the relationship between those who pay for infrastructure and those who benefit from it. In fact, New Zealand is already something of a world leader in road pricing. Many freight users already pay per kilometre of public road they use via the New Zealand developed EROAD system. Road user charges for diesel vehicles are also a form of road pricing and even fuel levies channelled through the hypothecated National Land Transport Fund are an indirect road charging mechanism.

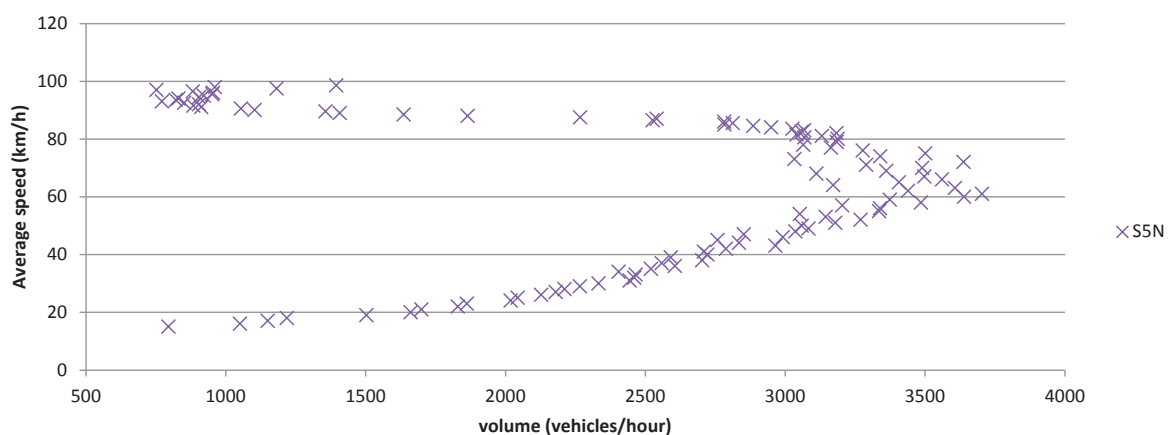
What separates these measures from a full road pricing solution is that they are not “dynamic”. That is, in contrast to a conventional market environment, the price consumers pay is not sensitive to supply and demand; travel at busy times when demand for road capacity is high does not cost more than when travelling in the middle of the night. The weakness of price signals to reflect scarcity results in over demand – congestion. A dynamic or variable charge on road use which increases at busy times and decreases when capacity is available can help moderate traffic.

In contrast to some perceptions, the value of road pricing is not that it can be used as a demand management tool to disincentivise road travel. Its real benefit is that by managing access to corridors via a dynamic charge it can regulate speeds to increase – not decrease – the number of vehicles capable of using critical roads at peak periods.

That higher prices can be used to increase utilisation at first appears counter-intuitive, but it is the observable effect of reducing highly inefficient gridlock. Figure 56 shows that as the volume of vehicles using a portion of road increases, speeds begin to slow – at first very gradually, but then more rapidly. At some point – between 60 and 80km/hr at Mt Wellington – it is not possible to squeeze any more vehicles through the corridor. In fact, the more that vehicles try to access the corridor, the more speeds slow, resulting in reduced flows.

FIGURE 56

### Average speed vs flow on the southern motorway<sup>73</sup>



<sup>73</sup> Ian Wallis and David Lupton, The Costs of Congestion Reappraised, NZTA RR 489, February 2013.

Figure 56 suggests that if speeds on the Auckland motorway network could be maintained at somewhere between 60 and 80km/hr through busy periods, more vehicles would use the network than do currently. Thus if price can be employed to regulate demand for motorway use, capacity on the network will in fact increase, resulting in less vehicles on local roads and more revenue for improving transport.

Motorway network pricing is therefore both a funding and a demand management tool.

The benefits to Auckland of road pricing have already been demonstrated. Two different road pricing options were investigated in 2014 by an Independent Advisory Body (IAB) established by the Auckland Council. One was partially dynamic (with tolls fixed at higher levels through busier times and lower levels or free at other times, but overall set at \$2 per vehicle) and the other was static (a fixed charge, assumed to be \$2). The toll or charge was conceived to impact every vehicle which entered the Auckland motorway network.

Despite only limited use of charging by time of day and no change in charge for the length of road used, modelled Auckland road pricing options delivered superior transport

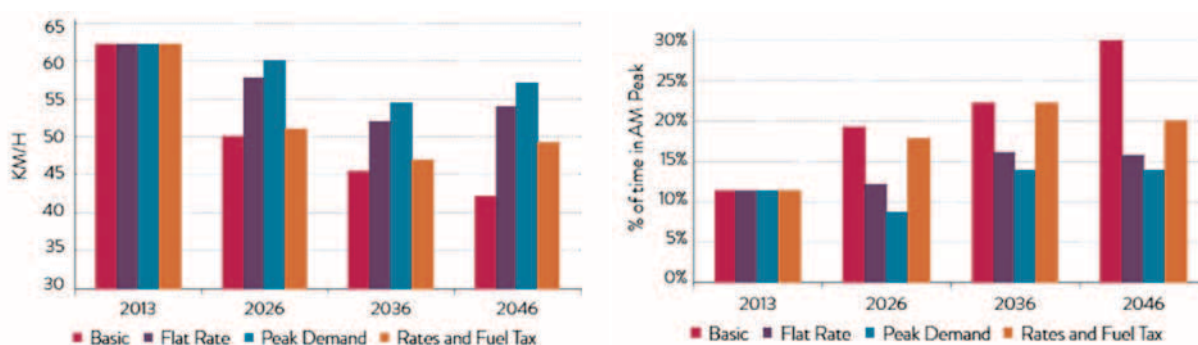
benefits to other funding options (including expanding rates and fuel taxes). Variable ('peak demand') charges also outperformed the flat charge alternative – speeds on motorways were faster, congestion lower and net benefits greater.

Included in the findings of the IAB, and anticipated by Figure 56, is the minor impact on local roads. The most common objection to motorway charges is that users will avoid tolls, thereby congesting other parts of the road network. However, efficiently priced access provides the opportunity to shift a heavier proportion of road demand onto motorways and off local streets, delivering net user benefits across the region.

Current technology technically permits comprehensive direct charging for all road use. GPS or other technology can measure per kilometre usage with higher rates at busy times and lower rates off peak. Aside from a still real public concern over monitoring, the principal reason why this solution is less viable is that it would require a more comprehensive national solution to what is a mainly Auckland problem. GPS receivers or other technology would need to be installed in all vehicles which use the Auckland network, creating issues for travellers from outside the region.

FIGURE 57

### Speed and AM peak congestion on the strategic freight network<sup>74</sup>



<sup>74</sup> Independent Advisory Body, Funding Auckland's Transport Future, 2014, where Basic=no additional funding; Flat Rate=flat \$2 toll; Peak Demand=dynamic toll average of \$2; Rates and Fuel Tax=additional funding met by conventional sources.

### Would implementation of motorway tolls today offset the need for new motorway capacity?

If motorway tolls could be established today to manage demand, could they not then also be used to defer, potentially permanently, new motorway investment? If the object of public policy was least cost investment, then early and punitive adoption of motorway tolls to control demand would be an option.

However, as articulated by ATAP, public policy objectives are more generalised and more ambitious. The object of planning, investment and wider policy is not to minimise costs, it is to maximise broadly defined benefits given available, and to some degree flexible, resources. Motorway expansion is optimised when provision of lane capacity is sufficient to meet demand at the price threshold needed to build, operate and maintain the network. If the charge required to recover investment in the motorway system is too high, then demand will fall and capacity will not be utilised, indicating no new supply (i.e. motorway capacity) is necessary.

If, on the other hand, higher charges are required to manage demand down than are required to build, operate and maintain the network, then that is a signal that capacity is not available at the optimal level. More investment would therefore lead to higher overall public utility by delivering services which satisfy need at the price point at which users are prepared to pay.

Balancing the supply of capacity to demand in this way is consistent with other monopoly utility services. Watercare operates on a similar model, as do Vector and Transpower. What does complicate the motorway charge system is if proceeds from motorway charges are redirected into other transport modes which do not reduce demand on the motorway network in proportion to the revenue they receive.

A tolled motorway network should, therefore, be separated from the wider transport funding and delivery framework. An efficient self-sustaining motorway charge would cover all motorway costs, with only an allocation from the NLTF sufficient to compensate motorway users for fuel and road user levies paid while utilising the motorway system. To ensure alignment with wider transport policy, the objective of the motorway system would have to be set to maximise flows at various times in order to shift traffic off local roads. New investments which attract vehicles away from the motorway network would be subsidised by motorway users in proportion to how much demand is reduced.

This approach would allow delivery of an efficient funding and demand management system which balances the broadly defined benefits of new motorway investment with total costs. Land transport revenue which would have gone into motorway development could be redirected into local roads, public transport and walking and cycling facilities, helping to provide a better overall transport system.



## 4. Prepare for change

A planned and efficiently priced transport system aligned with growth and development, modelled to improve public outcomes and agreed by all affected parties must be the objective of a revised Auckland Plan. Despite all the benefits such a plan would bring, the speed of change in transport technology (among myriad factors) will without question invalidate the vast majority of expectations and projections.

This is not an excuse for doing nothing, but a reason to remain evidence-based and flexible when evidence changes. Information available today shows congestion worsening and public transport not accelerating at the speed required to achieve policy. Therefore, plans must change. The introduction of electric vehicles will likely lead to more driving and plans will have to adapt to that trend as it emerges. The introduction of autonomous vehicles may require less road capacity and less public transport outside dense urban cores. Plans will need also need to adapt to this evolution.

These “known unknowns” will be joined by a series of “unknown unknowns”. The best that can be hoped for is that, when evidence emerges, policies which no longer meet need are revised. Persistent monitoring, benchmarking and reporting in an open and transparent decision making environment is the best weapon against poor planning and investment.

Transport technologies should be and are being closely monitored by New Zealand transport authorities. At present, the timing and impact of these technologies, the most significant of which relates to autonomous technology, is unknown. Existing projections based on recent experience and some limited forecasting, such as the decline in price of electric vehicles, therefore operates as the best evidence to inform policy.

# Conclusion

If Auckland is to become the economic and cultural centre of achievement aspired to by political leaders, business and the residents of Auckland, congestion must truly be fixed and public transport revolutionised. The city's amalgamation, subsequent rates increases and new proposal to levy additional transport charges has raised expectation levels for what the city should deliver and under current projections these aspirations will not be met.

Land use policies which continue to favour private vehicle mobility while transport investment shifts to public transport are exacerbating congestion issues and not delivering the options people want and need.

Retrofitting existing and established land uses with the services required to meet economic and social needs will be costly to residents, communities and businesses and will not improve transport. An overhaul of the processes used to effect land use and transport planning and investment is required.

New population and development growth for Auckland should be limited to areas where the transport system is capable of sustaining demand. In areas with good access to rapid transit and other essential amenities, development restrictions should be loosened. In areas where travel demand is likely to result in additional private vehicle use, lower density land uses and stronger restrictions should be applied.

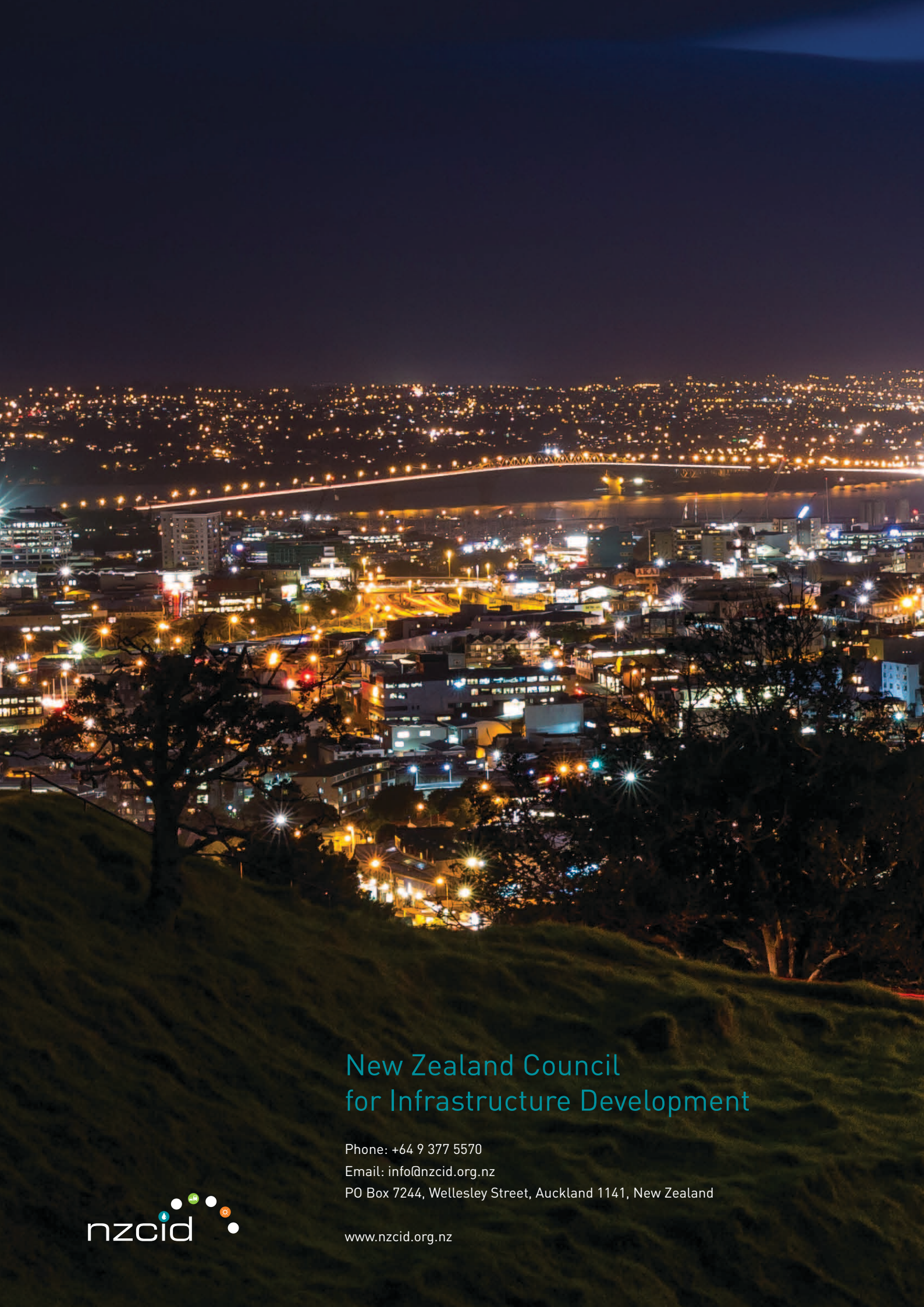
Opportunities to target intensified development around rapid transit in greenfield areas should be investigated. Land should either be pre-purchased by development authorities or the value uplift from rezoning and new investment shared across property owners and infrastructure providers. These discussions and processes must anticipate, not follow, investment and land use decisions.

Even with an optimally planned, sequenced, funded and implemented land use-transport programme in place, capacity on the road network will need enhancement to meet growth. Connectivity which provides opportunities for productivity and competition benefits across the region should be the priority of transport authorities looking to improve Auckland's future system.

Delivering new motorway capacity with funding sourced from those who benefit from services is the fairest and most efficient way of delivering the infrastructure Auckland needs. A well-conceived road pricing regime will increase the number of vehicles using priority corridors and will raise revenue. Stronger alignment of land use and transport, supported by adequate investment in capacity to meet demand, and efficient pricing of land and infrastructure will solve Auckland's transport challenge.







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